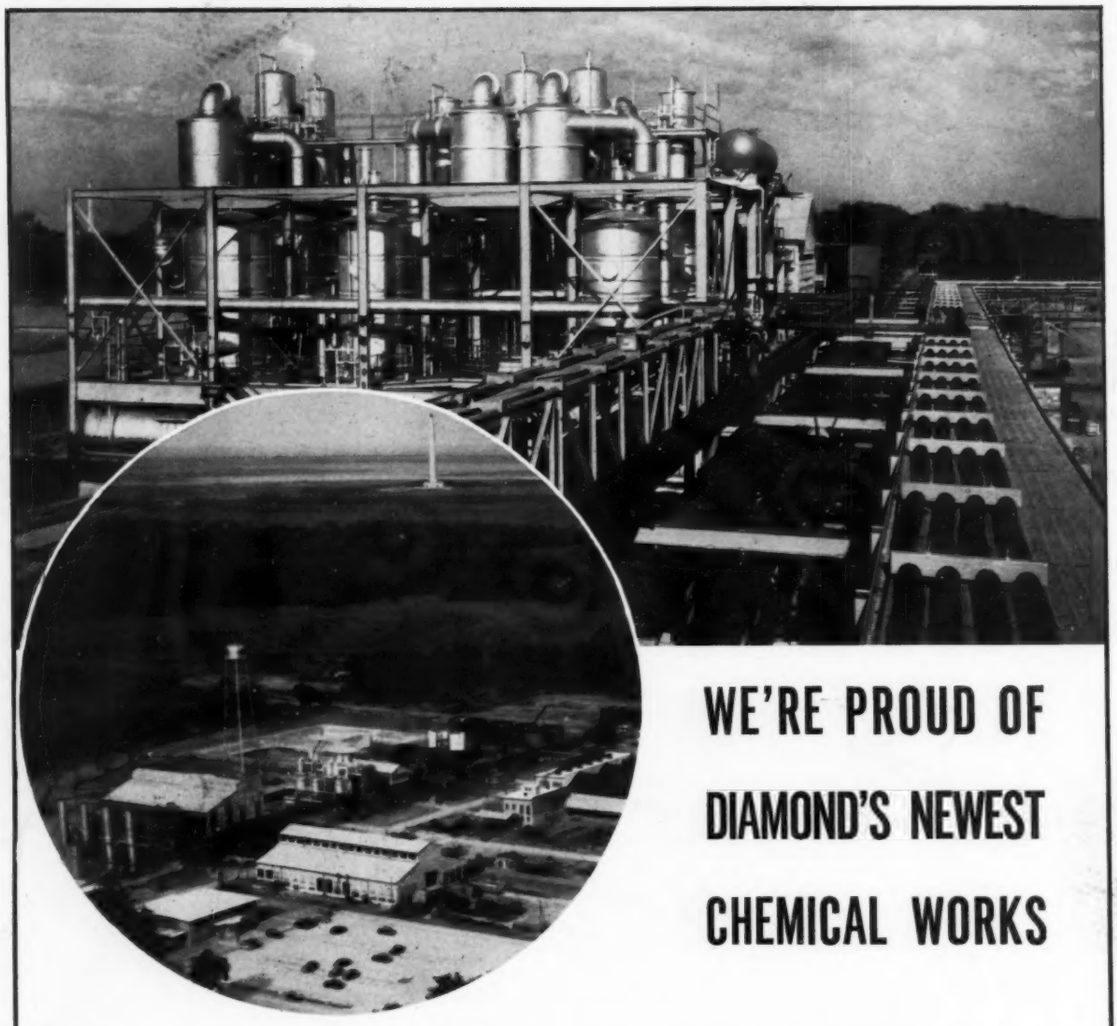
AUG 17 1948

World Petroleum

FIVE DOLLARS PER YEAR FIFTY CENTS PER COPY

August, 1948



WE'RE PROUD OF DIAMOND'S NEWEST CHEMICAL WORKS

Diamond Alkali Company's newest chemical plant, the Houston Works on the Houston Ship Channel, recently went on stream, manufacturing chlorine and caustic for what it's able young president, R. F. Evans, so aptly described as "the living, growing, expanding chemical industry." Brown & Root, Inc. are proud to have been selected for engineering and construction of this great plant—proud of the part we have in the process industry in the Southwest, which is fast securing its position as a world chemical capital.

BROWN & ROOT, Inc.

P. O. Box 2634 Houston 1, Texas

WORLD PETROLEUM

Founded by Russell Palmer

PUBLISHED BY MONA PALMER

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

E. W. Mayo
Editor

J. C. Chatfield
Managing Editor

Richard Sala
Art Director

SUBSCRIPTIONS

Annual subscription $5.00 (U. S.) postpaid
Single copies 50 cents

GENERAL OFFICES

2 West 45th Street, New York 19, N. Y.
(Tel. MUrray Hill 2-7333)

BRANCH OFFICES

LONDON: Georgian House, St. James, London S. W. I.

CHICAGO 1: G. H. Gannett, Mid-West Advertising Manager, 612 N. Michigan Ave., *(Tel. Superior 7-1273)*

CLEVELAND 14: F. J. Enright, Cleveland Advertising Manager, Union Commerce Bldg., *(Tel. Main 5693)*

DETROIT 2: R. F. Pickrell, Michigan Manager, 314 Stephenson Bldg., *(Tel. Trinity 1-0709)*

LOS ANGELES 14: W. S. Johnson, Western Advertising Manager, 412 West 6th Street, *(Tel. Mutual 1391)*

NEW YORK 19: R. K. McQuiston, Eastern Advertising Manager, 2 West 45th Street, *(Tel. MUrray Hill 2-7333)*

TULSA 3: O. F. Cozier, Mid-Continent Advertising Manager, 515 McBirney Bldg., *(Tel. 4-5555)*

World Petroleum is published by Mona Palmer, Trustee under the will of Russell Palmer

CONTENTS

VOLUME 19 AUGUST, 1948 NUMBER 9

Oil Industry Moves Ahead of Demand in 1948 33

The Rebel Well of Leduc 34

California's New Oil Field 36

Mexico Moves to Enlist Foreign Capital 38

Ready for the Unknown 40

Trends in Reciprocating Engines 42

Demand for Liquefied Gas Products 44

Venezuela's Big-Inch Line Nears Completion 46

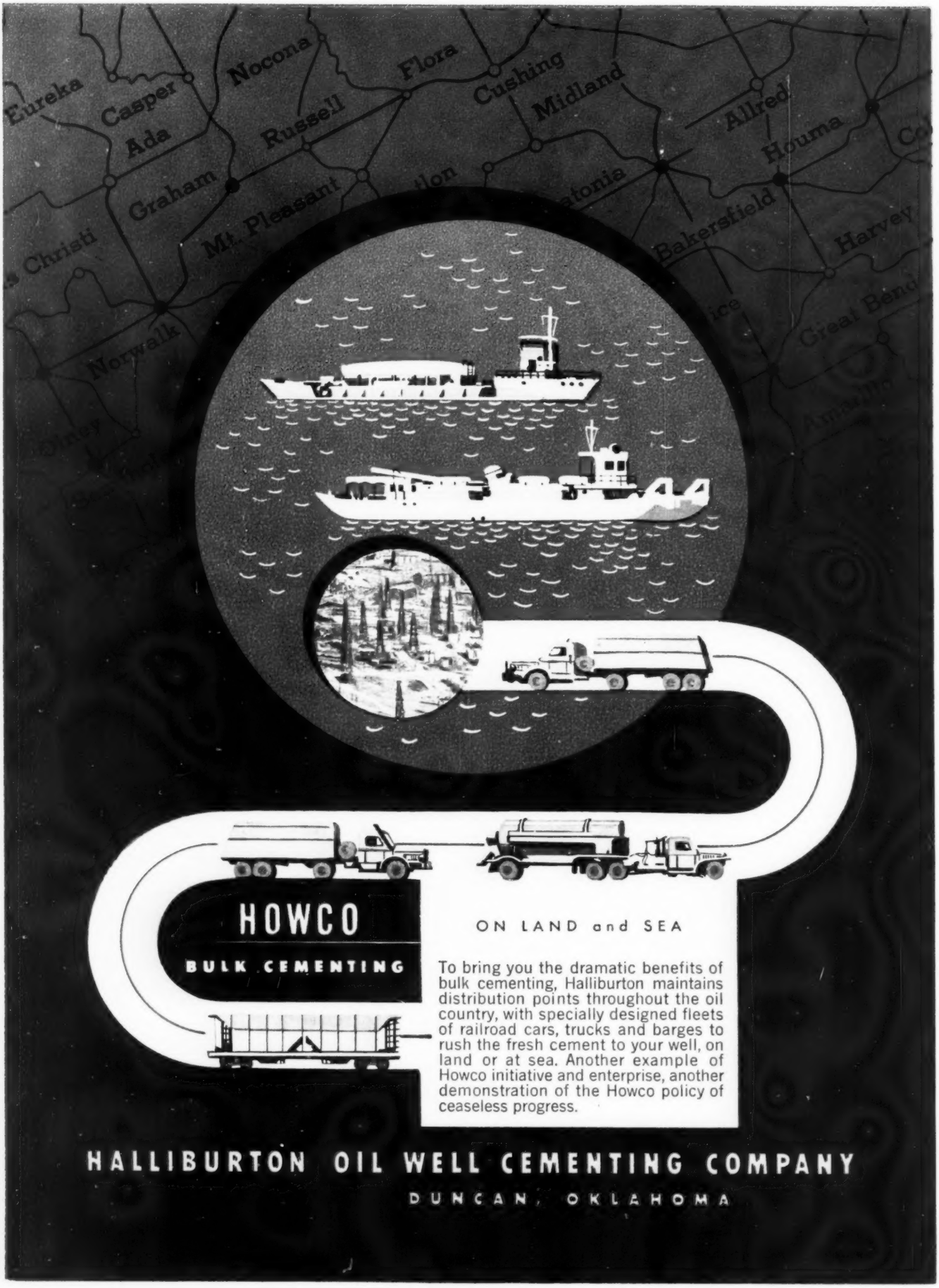
Oil From Shale 49

Sun's New Gulf Coast Terminal 52

International Notes 54

Oil Company Changes 56

THIS MONTH'S COVER—Modern jet fighter planes such as the Republic F-84 "Thunderjets" pictured on this month's cover consume in excess of 400 gallons of petroleum products per hour of flight. This compares with a consumption of 65 gallons per hour for the P-51 used in World War II. It is this step-up in potential demand which gives today's oil man uneasy moments when he contemplates the possibility of another major war. The F-84 has a top speed in excess of 600 miles per hour and has a cruising radius of 1,000 miles at altitudes up to 40,000 feet. It now is in volume production for the United States Air Force.


Eureka
Casper
Ada
Nocona
Russell
Flora
Cushing
Midland
Allred
Houma
Graham
Mt. Pleasant
Bakersfield
Harvey
Norwalk
Great Bend
HOWCO
BULK CEMENTING
ON LAND and SEA
To bring you the dramatic benefits of bulk cementing, Halliburton maintains distribution points throughout the oil country, with specially designed fleets of railroad cars, trucks and barges to rush the fresh cement to your well, on land or at sea. Another example of Howco initiative and enterprise, another demonstration of the Howco policy of ceaseless progress.
HALLIBURTON OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

AUG

OIL INDUSTRY MOVES AHEAD OF DEMAND IN 1948

IN the business world generally mid-year is accepted as a convenient time to review the preceding six months and to formulate an opinion as to what the remainder of the year holds in store. It is a time when the state of the crops and the general trend of industrial activity have become fairly well defined and when the factors that affect the barometer of business have had time to make their influence felt.

In the drive of the oil industry to keep output ahead of the constantly rising demand for its products, review of the first half of 1948 is encouraging, as it should be to consumers. It indicates that the danger point has been passed—some oil men assert it never existed — so far as the much-discussed shortage of gasoline is concerned, and it presents an encouraging picture as to the supply of heating oils for the coming winter.

Total requirements of the United States market are running higher than was estimated earlier in the year by statisticians of the Bureau of Mines, and their forecast of needs for the full period, based on actual results for the earlier months, was revised upward to 2,172 million barrels as compared with 1,989 million in 1947, an increase of 504,000 barrels daily. While some decrease in stocks took place during the first quarter of the year, supply since that time has risen more rapidly than demand, and it is anticipated that the year will end with stocks larger by 95 million barrels than at its beginning.

This more favorable situation is expected to result from the gain of over half a million barrels per day in domestic crude production, an increase of 60 million barrels daily in imports and a decline of 47 million barrels daily in exports. By this calculation the country is expected to become a net importer to the extent of something over 100,000 barrels daily for the first time in recent years.

In the supply of products during the first six months of 1948 the industry has made available for domestic use an increase of 643,000 barrels daily over the corresponding six months of 1947, according to a statistical summary of the American Petroleum Institute. This gain has been made possible by the rise of nearly 10 percent in crude production and of 12.8 percent in refinery operations with the change in the import-export balance as a minor factor. Though attracting no great amount of public attention, the work of upping crude production and expanding refining facilities to keep the flow of available products ahead of the extraordinary growth in demand is making steady progress month by month. This huge task on which the industry embarked with all its energies directly following the war and in which it is investing billions of capital will give still greater results in the next few years. Meanwhile the present refining plant is operating at better than 90 percent of capacity, a record remarkable in any industry.

Gains of the industry in volume output and stock position during the first half of 1948 have been achieved in face of an increase of over 10 percent in domestic demand for gasoline and of more than 20 percent in requirements of distillate fuels. Continuance of the extraordinary growth in the use of diesel and heating oils, which has gone on unabated since the close of the war, has been a matter of concern to the refining industry and has necessitated changes in the operating ratios of many of its plants, changes which have been difficult in view of the pressure for more and more gasoline.

Looking at the situation from the vantage point of the past half year's accomplishment, certain obvious conclusions may be drawn as to the period just ahead. By enlarging the production and processing of oil at a rate greater than the continued rapid growth in demand, the industry has fortified its position and its ability to meet unexpected conditions that may arise. Stocks of gasoline at the end of the first week in July were 17 percent larger than they were a year earlier, and stocks of distillate fuels were 18 percent higher. The latter showing is perhaps the more surprising in view of the fact that demand for distillates in the second quarter of the year showed much less than its usual decline from the preceding quarter.

While the third quarter of the year is the time of heaviest gasoline consumption, the larger stocks and high rate of production provide ample insurance against any lack of supply for motorists' needs. As to heating oil the provision for the heavy consumption of the coming winter is definitely better than a year ago, both in stocks on hand and current rate of production, even with allowance for the continuing upswing in demand. Fuel oil distributors are conducting a campaign urging consumers to fill their tanks and add to storage capacity before cold weather arrives, recommendations that seem to be generally heeded.

The significant point in a review of the first half of 1948 is that the oil industry has added another to its many past records of rising to the needs of the time in meeting the demands made upon it, no matter how heavy or unexpected these may be.

A typical Leduc well coming into production.

THE REBEL WELL OF LEDUC

By J. L. IRWIN

THE rebel well of the famous Leduc oil field, Atlantic No. 3, has been brought under control. Speedy and drastic action taken has given protection to this vitally important Alberta area, and anxiety is being removed.

On March 8 of this year the well was subjected to the most serious blow-out ever experienced in the field. With a 50-million cubic foot per day gas flow, oil was forced out over the derrick and sprayed the countryside for some distance. At that time the flow was estimated at 200 barrels per hour.

After 37 hours of frenzied effort when 100 tons of mud mixed with cement, sawdust and calcium were forced against the flow, the well was killed long enough to establish a Hausmer head into position.

At the time of the blowout, the well was drilling a few feet from the top of the D3 section of the limestone. Circulation had been lost and the crew was trying to recover it when the catastrophe took place. After it had occurred and had been controlled for the time being, bulldozers dug ditches in the snow in the hope that oil lying in the surrounding fields would drain off later with the water. About half of the estimated 7,000 barrels of oil thrown over the land during this period was recovered.

Two weeks later another gas blowout took place. Due to faulty casing at depth, the gas was finding its way to the surface and was bubbling

Gas bubbling up through pits filled with oil which has worked its way through craters at considerable distance from the well.

through the ground, in some cases at distances of 300 yards from the derrick. Control was once established after two days spent in shooting 1,000 bags of cement into the hole.

Two months went by during which time it was known that the situation surrounding Atlantic No. 3 was still serious and still requiring intensive efforts in order to establish safety. By the middle of May a report was issued that the well was blowing as much as 10,000 barrels of oil per day through small craters in the vicinity of the derrick, backed by a gas flow of 50 million cubic feet per day. In many parts of the field veritable lakes of crude oil existed by that time. It became imperatively necessary that the pools should be cleared up and the oil salvaged.

Under normal restricted production the field by then had been running at 6,000 barrels per day through the pipeline, but Atlantic No. 3, one single well, was demonstrating its ability to produce through craters at the rate of 10,000 barrels per day and deposit the oil in sumps surrounding the well. It was certainly a revelation as to Leduc's potential capacity. It was also the moment to take drastic and immediate steps to control the situation. This was done without delay.

The government of Alberta and the Petroleum and Natural Gas Conservation Board issued a special order, effective at 8 a.m., May 13, that the entire field should shut down until the problem had been solved. No oil was to run from Leduc's 60 producers from that date until further notice, and the pipeline was to be left free to run off the surplus oil which had come, and was continuing to come, from Atlantic. There was to be no shutdown of normal drilling operations which would continue.

Up to that time 10,000 tons of cement had been pumped into the wild well. This was followed by 100 tons of filler material such as redwood shavings, sawdust, feathers, cottonseed hulls, fibre and similar products together with a great quantity of high viscosity mud.

Appointment was made by the Conservation Board of V. J. Moroney, assistant to the divisional manager of Imperial Oil, Ltd., to take over full charge of field operations. Under the direction of Myron Kinley, blowout and oil fire expert from Texas, additional blowout and control equipment was installed at the head of the casing. Two seven-inch flow lines were connected with the head, after which the well was to be opened up wide with the flow to come through these lines. It was hoped that this would relieve pressure and stop much of the flow into craters surrounding the well, thereby giving an opportunity to remove surplus oil from the sumps. It was further decided to direct some of the flow back into the formation through the nearby Nos. 1 and 2 wells, the balance to be run off through the pipeline to Nisku, which had been made available for that purpose exclusively.

Added to this it was decided to drill two "relief" wells in the vicinity of Atlantic, the drilling to be made directionally to tap the D3 zone close to the bottom of that well. This it was hoped would relieve the pressure from Atlantic and make it possible to close it down satisfactorily.

On May 28 the report was issued that about 120,000 barrels of oil from Atlantic No. 3 had been pumped through the pipeline to railhead at Nisku during the first 12 days under Conservation Board control. Added to this figure, several thousands barrels had been pumped back into the formation through Atlantic No. 1 starting on May 21. The latter operation had been carried out at the rate of about 60 barrels per hour or 1,440 per day.

On June 14 the report came that deliveries of oil from Atlantic No. 3 had totaled about 225,000 barrels, of which 187,000 barrels had been pumped into the pipeline since May 14, the date when the Board assumed control of all operations Proceeds from sale of oil, already delivered and continuing to be delivered, were held in trust by the Board. First claim on these sums was the payment of control costs and operations to kill the well, disposition of the balance to be decided on at a later date.

Up to this time some 225,000 barrels of water had been pumped into nearby Imperial No. 48 well at the rate of about 40,000 barrels per day. The two relief wells, to be drilled to a point close to the D3 zone of Atlantic, are both progressing satisfactorily. One is about 756 feet west and 75 feet north of the wild well; the other about 700 feet west. The flooding of Imperial No. 48 with water is expected to seep through to Atlantic's porous structure and by mixing with the gas flow in that well to reduce the pressure there so that the well can be approached more easily for killing operations. Delays to this side of the work were caused for a time by the near flood conditions of the Saskatchewan River.

The record 24-hour period in oil from Atlantic through the pipeline was 12,842 barrels, the minimum day being 10,345 with an average for the period of about 12,000. An average of around 10,000 barrels daily has been flowing into the craters.

The Board now reports that the vast amount of accumulated oil from the open pits surrounding Atlantic has been disposed of through the pipeline with the exception of emulsified oil which will have to be treated before removal. Resulting from this, normal production from the field is to become once more effective. Oil from loaded tankage must first be removed before the field returns to production on an allowable basis. Consideration is being given as to amount of total allowable for general production over and above continued heavy production from Atlantic, prior to that well being finally killed. Capacity of the pipeline is 30,000 barrels per day.

The danger of fire, now considerably removed, has been a real one. Had anything happened to start a conflagration, it is hard to say what the results might have been with the ignition of so huge a quantity of oil lying in open pits. Every precaution, however, was taken to prevent this. The general area surrounding the well was shut off from the public and entry could be made only by permit. Speedy and efficient action appears to have eliminated much of the danger, and the officials and crews attending to this vitally necessary and very dangerous operation have earned much gratitude from both the oil industry and the general public.

A considerable amount of rather hysterical publicity was given to the whole situation just prior to the time when the Conservation Board took over. A small panic took place in the market and stocks dropped. Almost immediately, however, they steadied and rose again. The adverse publicity had acted as a sort of boomerang. Toronto and New York suddenly woke up to the fact that the Leduc field possessed a well which had been performing at the rate of 10,000 barrels per day from the D3 zone of the limestone over a period of about three months without drawing any water. This was a remarkable exhibition of the field's ability to produce and a potent reason, when the field resumes normal production again, for an increase to be made in the daily allowable production rate of the D3.

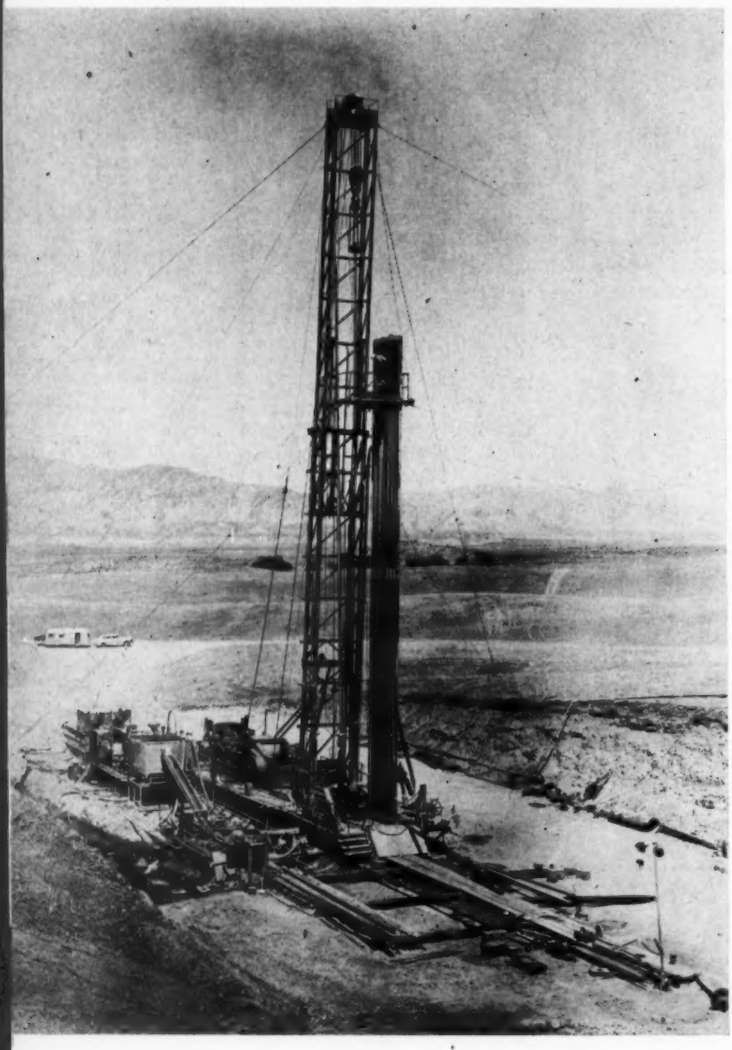
The markets of the east up to now have been viewing Leduc's restricted production of 100 and 150 barrels a day without giving consideration to the fact that in a water-driven oil field such precaution is most necessary. They have placed these rates in their minds as more or less representing productive capacity. It took Atlantic No. 3 to show what the field really could do and what it really was.

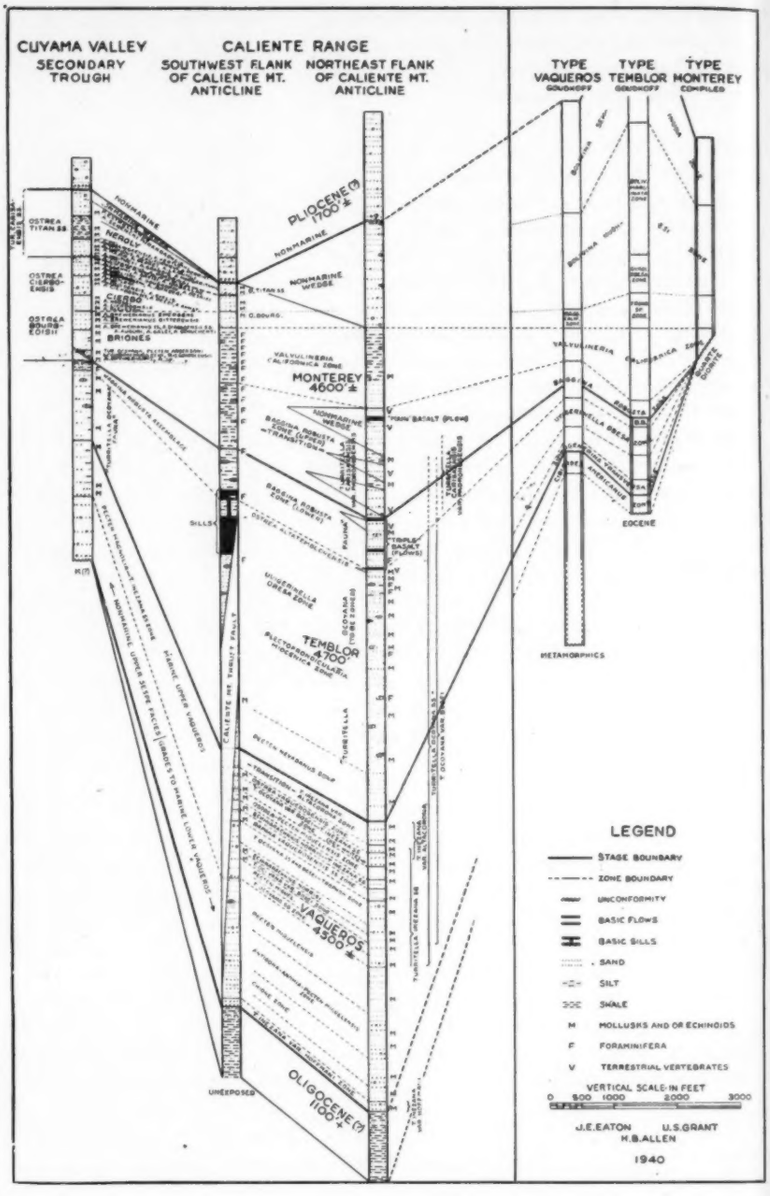
Following this realization comes the reported statement made by W. O. Twaits, manager of the economics department of Imperial Oil Limited at Toronto. The occasion was the annual general meeting of the Canadian Manufacturers' Association. At this meeting Mr. Twaits stated that "with moderate optimism on the prospects of further discoveries in the Edmonton area, a production of 65,000 to 75,000 barrels of oil per day can be visualized within three years' time." Current production is 6,000 barrels per day on present rate of restriction.

The volume prophesied for Leduc by Mr. Twaits together with that of other Alberta productive areas would exceed prairie requirements, and extensive planning for pipeline transportation to distant points and increased refining facilities would become necessary. An expenditure of from $65 million to $75 million for these two facilities may be required to anticipate new Alberta discoveries in addition to exploration and development drilling.

As a result of all that has happened from Atlantic No. 3's spectacular exhibition—and it certainly was a spectacle for a time with lakes of oil bubbling and spouting like boiling water in a saucepan—the public in general has at last begun to realize that Leduc's potentiality, and the potentiality of its general surrounding area, is a very powerful one.

CALIFORNIA'S NEW FIELD MAY BE BEST OF A DECADE





Columnar sections of Cuyama Valley, Caliente Range.

← Richfield Oil Company's Russell A-17-5 drilling at Cuyama. House trailer in background is typical of crew housing in this area.

MUCH interest had been aroused on the Pacific Coast by Richfield Oil Corporation's recent discovery in the Cuyama Valley district of California which was made exactly twenty years after the discovery of the Elwood field at Santa Barbara County. It appears to be of considerable importance, especially because present production suggests the possibility of subsequent discoveries and raises the hope that here may be the prolific field the state has been looking for. The Colgrove and Russell leases of Richfield, approximately two miles apart, are producing from the Vaqueros formation of Miocene age, and if samples of the Vaqueros sands from Elwood and Cuyama are placed side by side, it is impossible to tell them apart. In addition to being identically similar in appearance, the two sands are identical in permeability and show comparable gas-oil ratios. It is quite possible that eventually the Colgrove and Russell areas may be joined together, although this remains to be determined, as faulting is a major factor in this region.

Cuyama Valley is in Santa Barbara County, about midway between the San Joaquin Valley and the coast. It is a deep sedimentary basin about 50 miles long and 15 miles wide. The valley is enclosed by mountains which seem definitely to limit the potential areal extension of the field. Geologically it is classified as a Miocene formation with heavy deposits of petroliferous marine shales and silts. The presence of oil was indicated by seeps along a well-defined syncline, though of course its exact location and extent could only be determined by tests of the drill.

Richfield Oil Corporation has made an intensive geological study of the area and has acquired leases covering some 150,000 acres. Several other operators with holdings in the same area are engaged in active exploration.

Actually the first producing well in the valley

was Cuyama No. 2 of the Norris Oil Company in a section west of Richfield's operations, but it was comparatively small and did not attract much attention. It produced a 20-gravity crude in contrast wtih the 38-gravity oil produced by Richfield's succeeding completion. Richfield's Cuyama discovery well was Russell A-25-5 in section 5-10N-27W. It was completed on June 13, flowing 508 barrels per day of 38.3-gravity oil from an effective depth of 3,360 feet. Richfield's second completion, Colgrove No. 2, was brought in flowing at a daily rate of 4,080 barrels of oil and 1,500 mcf of gas. Its daily rate is based on a one-hour flow test, during which it produced 170 barrels of 32.8-gravity oil through a 96/64-inch bean. Flow pressure on the tubing was 180 pounds. The well has subsequently been beaned back to 610 barrels daily through the use of an 18/64-inch bean, and at this rate of flow shows a tubing pressure of 480 pounds. The company is experimenting to determine the maximum efficient rate, and when this is determined, the flow will be restricted to that amount.

An outstanding characteristic of both Richfield wells is the low gas-oil ratio which has led some to believe that the flow of oil is due to hydrostatic pressure. Richfield's discovery was made in Temblor formation of Miocene age and porosities and permeabilities are extremely favorable.

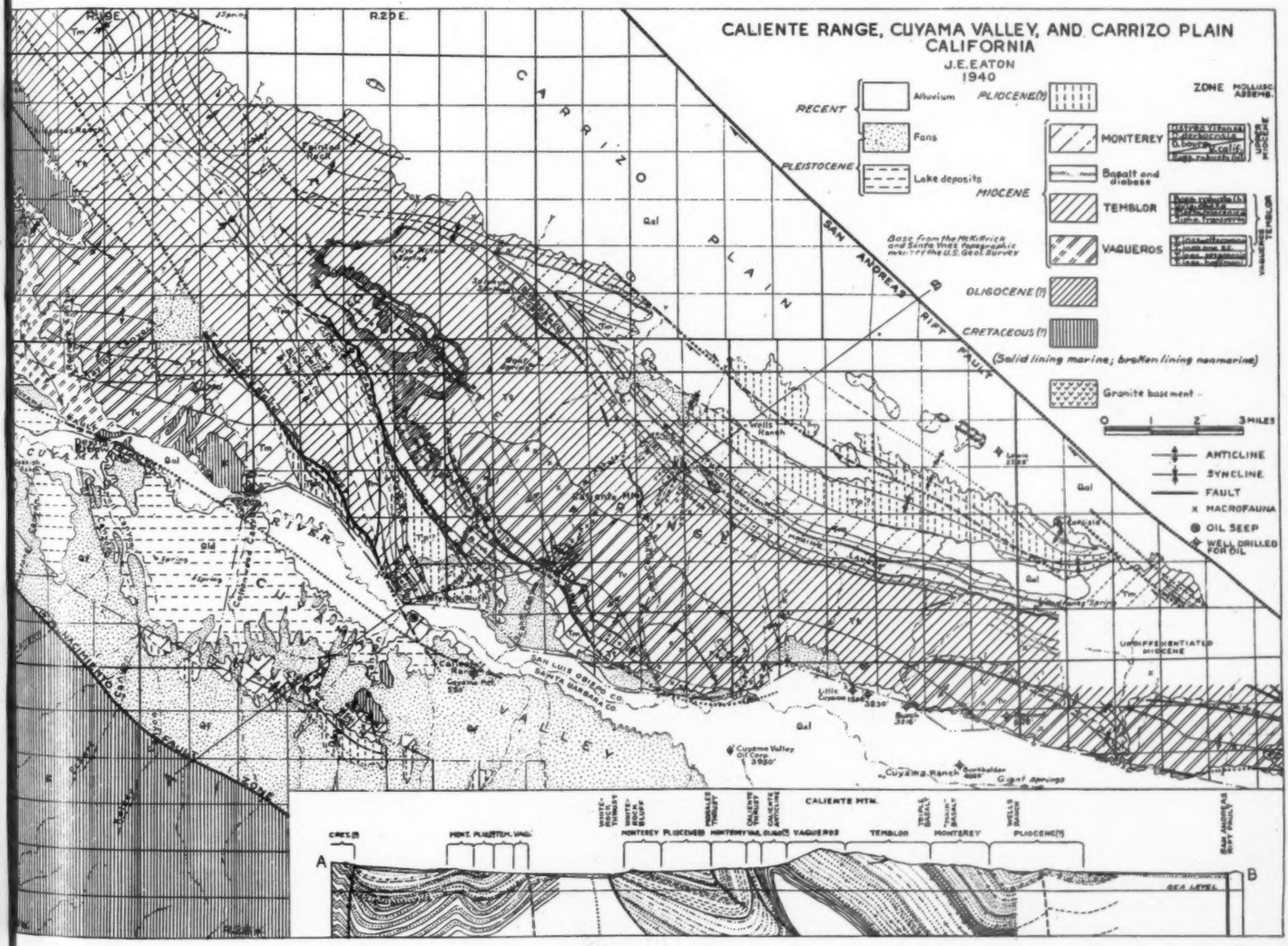
Richfield has three producing wells. It has two others in progress and has plans for several more. A drill stem test on one of the wells not yet completed was reported by the company as showing an indicated flow of 6,000 barrels per day. A statement issued by the company directly after its initial well was brought in reported that it was producing from 250 feet of sand between 2970 and 3360 feet.

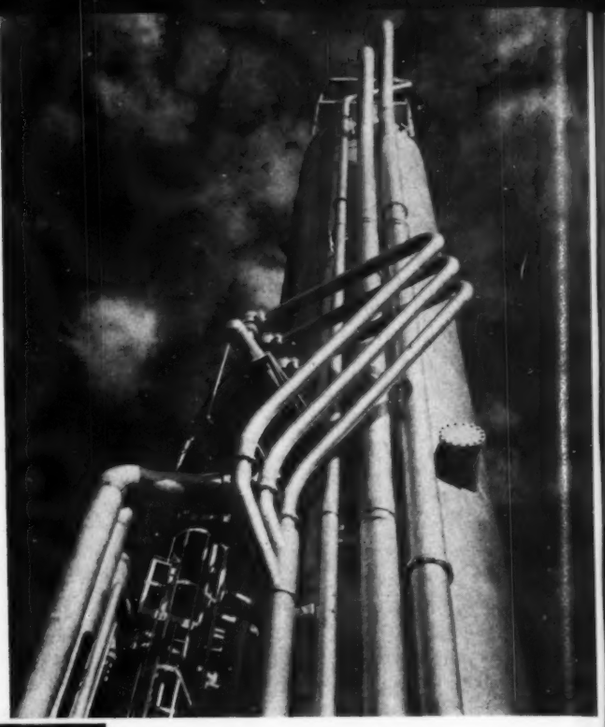
Temporary pipeline facilities are being rushed to completion, and tentative plans call for the line to be in operation around August 1 or shortly thereafter. Richfield's new line will consist of 30 miles of six-inch line extending from the Russell area to the company's facilities in the Santiago field. For the present one pump station and arequate tankage are being constructed in the Russell area, and similar equipment is being provided for the Colgrove area. This line will move above 10,000 barrels daily and is a temporary expedient to handle immediate anticipated production. Ultimately this area will be connected with the company's main trunk at the San Emidio pump station to the east, thus bypassing Lake pumping station and the Santiago area. This will permit greater flexibility, but under existing conditions the present line is the best that can be done due to pipe shortage.

All indications thus far are that Cuyama Valley will prove to be a discovery of major dimensions and that it may be the most important developed in the past decade. All those associated with the operations are maintaining a cautious attitude and insisting that optimistic predictions be withheld until more wells have been put down and the productive area more fully delimited. At the present rate of progress it will not take long to arrive at that determination as oil has been found at relatively shallow depths and drilling progress is rapid.

Richfield's most recent completion was the Anderson-Colgrove No. 2, located approximately 1,000 feet northwest of the first well on his lease. The well tested 8,000 barrels per day of 34 gravity oil. It now is beaned back to about 600 barrels daily.

Geologic map and cross section of Caliente Range, Cuyama Valley and Carrizo Plain.

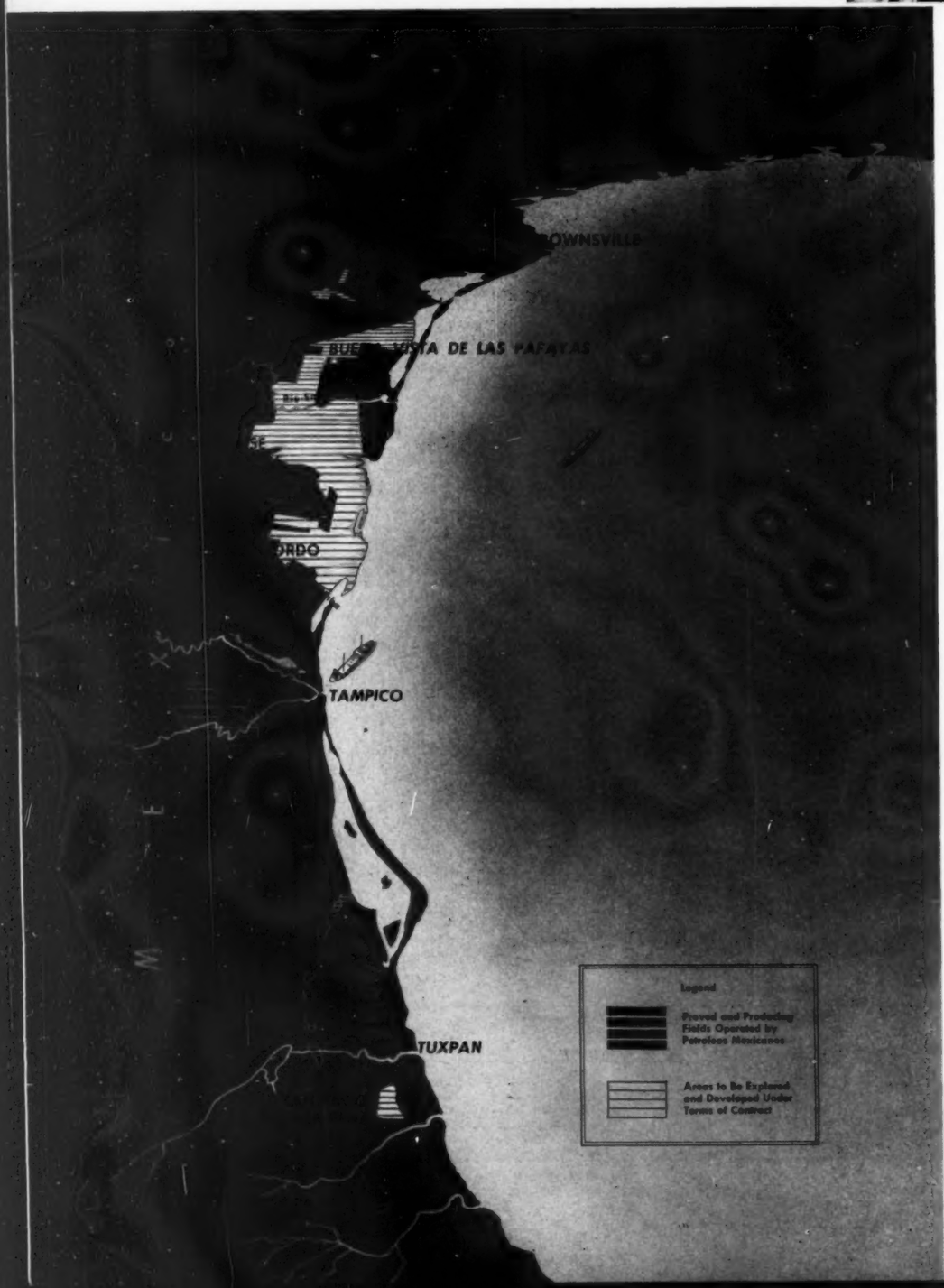




Fractionating column at Poza Rica plant.

MEXICO MOVES TO ENLIST FOREIGN CAPITAL

By Douglas Grahame


TAMPICO
TUXPAN
Legend
Proved and Producing Fields Operated by Petroleos Mexicanos
Areas to Be Explored and Developed Under Terms of Contract

Map showing area to be explored in Mexico under agreement with Cities Service interests.

N official circles here in Mexico City confidence is high that way has been found to bring about the greatly needed development of the country's oil industry and to do it without weakening governmental ownership of petroleum resources and control of their exploitation. For several years the importance of increasing production and enlarging facilities has been pointed out repeatedly, but obstacles have stood in the way of substantial progress. Foremost among these has been the problem of financing. To this was added during the war the inability to obtain equipment. One noteworthy addition to processing facilities was the reconstruction of the Azcaputzalco refinery, aided by a loan from the United States Import and Export Bank. This has added to the output of high grade gasoline.

Meanwhile, since the close of the war, a great increase in demand for petroleum products has taken place which has made the need for greater capacity in all branches of the industry more pressing than ever before. This situation revived discussion of a possible modification of Mexican policy that would induce outside capital to engage in oil field development. There were reports of negotiations for a large loan from the United States and of discussions with various American companies interested in supplementing their supplies of crude. The stumbling block to the conclusion of arrangements with private investors appeared to be the provision of Mexican law forbidding the grant of concessions such as were ended by the expropriation of 1938 and the insistence that Mexicans should have the controlling share in any mixed-capital companies engaging in the oil business. Arrangements were made, however, for certain drilling and other work to be performed on contract, and this suggested itself as a possible basis for more extensive agreements.

Senator Antonio Bermudez, general manager of Petroleos Mexicanos, defined the government's position as one of willingness to accept the cooperation of private capital but added that

Ing. Jaime Merino, Pemex field superintendent in Poza Rica.

those who proposed such participation must "come with the mentality of 1948", which meant, he explained, that they must forget conditions that prevailed prior to 1938 and must conduct themselves in strict accord with Mexico's legal system. Senator Bermudez defined the acceptable contractural arrangement as follows:

"The contractor is made to understand the risk he takes. That is to say, it is made plain to him that he has no right to retrieve funds that represent the costs of work, particularly that performed in the quest of oil, which leads to no practical result. Nevertheless, Pemex offers to pay in oil for productive wells." In other words any foreign group or company that desires to engage in the search for oil in Mexico must take the loss resulting from bringing in dry holes, but if productive wells were brought in, payment would be made from the oil produced plus a bonus for the discovery.

The first deal made in conformity with this plan was concluded between Pemex and Cities Service Company. It conforms in a general way to the requirements outlined above but has an exceptional background. The expropriation decree, it will be recalled, grew out of demands by the oil workers union upon the big foreign-owned companies with which the latter found themselves unable to comply. Several smaller operators, among whom Cities Service was one, were not involved in the labor dispute and their holdings were not immediately affected. The policy adopted by Pemex was to make settlements with these companies by which their physical properties were acquired.

At the time of expropriation Cities Service held exploratory rights on something more than a million acres made up of several tracts in northeastern Mexico on which only preliminary surveys but no actual development work had been done. This claim, it is understood here, was not extinguished in the transfer of the company's other properties but was left as the legal phrase is "in statu quo". These are the areas to which the agreement completed earlier this year applies.

The contract is between Mexico-Cities Service Petroleum Corporation, a Cities Service subsidiary, and Petroleos Mexicanos. Under its terms the former will provide capital for exploration and development of these areas. The prospect of finding oil in substantial quantities is regarded favorably because of their location in relation to past prolific production and because of indications from preliminary geologic surveys previously made. As reported here, the work of exploration will be conducted by Pemex, but Cities Service will provide technical assistance and will aid in obtaining equipment. Any oil produced will be the property of the Mexican company. From the sale of the products derived from such oil, funds will be set aside to repay the costs of the successful exploration. In addition a sum representing between 10 and 20 percent of the proceeds from sales will be paid to the company later as a bonus. Oil will be sold at world market prices, and the American company will have preference in purchasing at these prices, but no requirement shall be made for the export of oil unless home requirements are being fully satisfied. The contract is stated to extend over a minimum of 10 years and a maximum of 20. The regions included in the contract comprise more than 1700 square miles. Areas known as San José de las Rusias, Sabino Gordo, and Buena Vista de las Papayas, total over a million acres and extend northward along the Gulf Coast for a distance of 120 miles from a point about 40 miles north of Tampico. Another area, Santiago de la Peña (9100 acres), lies 110 miles south of Tampico near the prolific Poza Rica field. A fifth area, La Misión y El Mogote, 25,500 acres, is near the town of San Fernando.

Somewhat different in form is the agreement more recently negotiated with The Texas Company. This provides for a loan of $30,000,000 by the oil company which can be used by Pemex for general purposes. The loan with interest is to be repaid by delivery of three million barrels yearly of heavy-type crude, according to the information given out here. The oil company, it is stated, will also extend technical advice and assistance to Pemex in its operations. It is understood that proceeds of the loan will be used partly or largely in refinery construction or enlargement, but the advance does not constitute a lien on any Pemex properties. Final approval of this agreement had not been reached between The Texas Company and Pemex as this was written.

In view of the obligations it is assuming, the Mexican company is anxious to increase its production in order to provide larger amounts for exportation in addition to its primary requirement of satisfying the needs of the domestic market.

A recent statement by the Pemex chief revealed that Mexican oil is being exported to the United States, Cuba, France, Great Britain, Italy and Belgium, but the quantities were not stated. The latest statement of current crude production is 167,000 barrels daily or at the rate of something over 60 million barrels for the year as against nearly 57,000,000 in 1947. A source close to Pemex states that a 200,000-barrel daily output is expected before long, as a result of good showings by new wells, among them Moralillo No. 6, eight kilometers west of the famed Cerro Azul field in northern Vera Cruz, which has an average daily yield of 1,000 barrels. This source, assuming that drilling now under way by United States contractors will aid production, foresees a crude output of 73 million barrels in 1949, the greatest for any year since the lush boom times of Tampico in the early 20's. Known reserves are now calculated at 1,058 million barrels.

Pemex has announced that it hopes to drill 53 wells in 1948, explaining that while exploration is expensive it is imperative because it is the base for the future life of the oil industry. Pemex is keeping several geological and geophysical crews in the fields at present.

In an interview with a Mexico City newspaper Senator Bermudez recently declared that Pemex is not to be regarded as a profit enterprise but as "an institution of social service and aid for the country." Holding strictly to that principle, he said, Pemex has preferred to sacrifice good profits from exports to assist Mexican industry. As an example, he cited the case of the government-owned National Railways to which Pemex is selling 30,000 to 35,000 barrels daily at a loss, which enables the railways to haul goods at rates lower than if market prices were charged.

In his interview Senator Bermudez stated incidentally that Pemex has never invited individuals or companies to make well drilling contracts but that such proposals always have come to it from outside. However, he said, Pemex is not opposed to making such contracts when it deems they are for Mexican national welfare. He expressed confidence that production will be greatly increased during the term of President Miguel Aleman (1946-52) over what it was in 1946. Home consumption, he said, in the time of the private companies was 15 to 18 percent of production, and exportation was then 82 to 85 percent. Now, he said, home use is 85 percent and exportation 15 percent. Home market distribution services are constantly being increased.

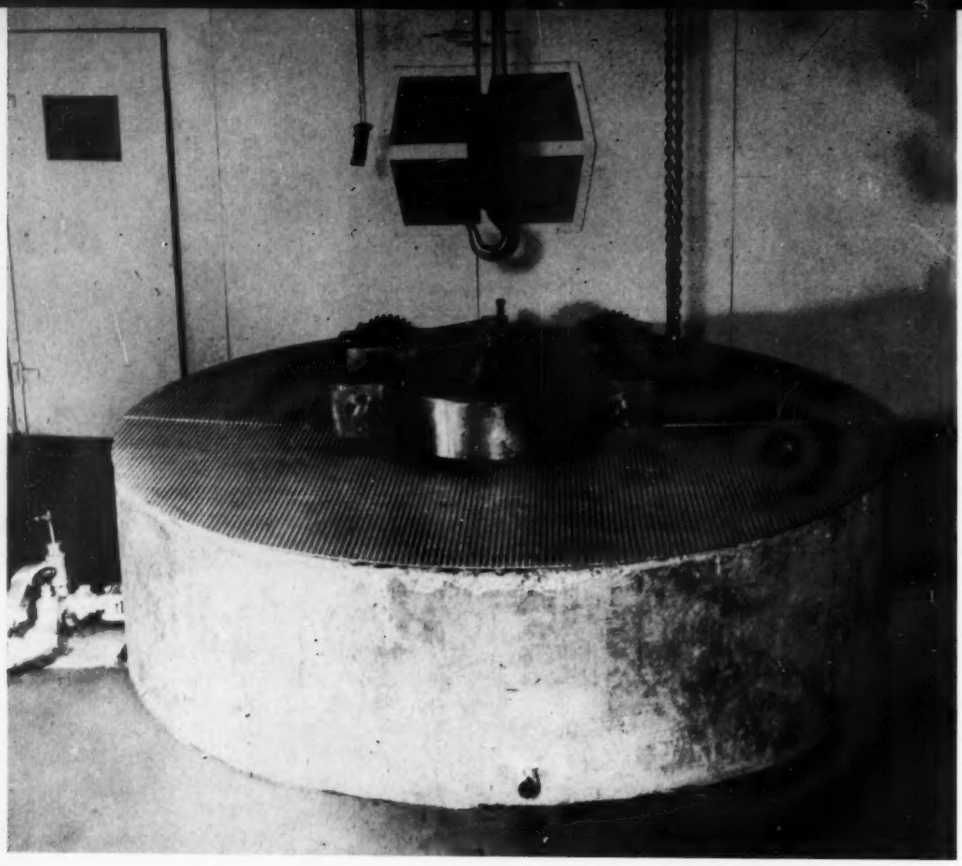


Fig. 1—Experimental well of forged steel with concrete bath.

READY FOR THE UNKNOWN

By C. E. CLASON

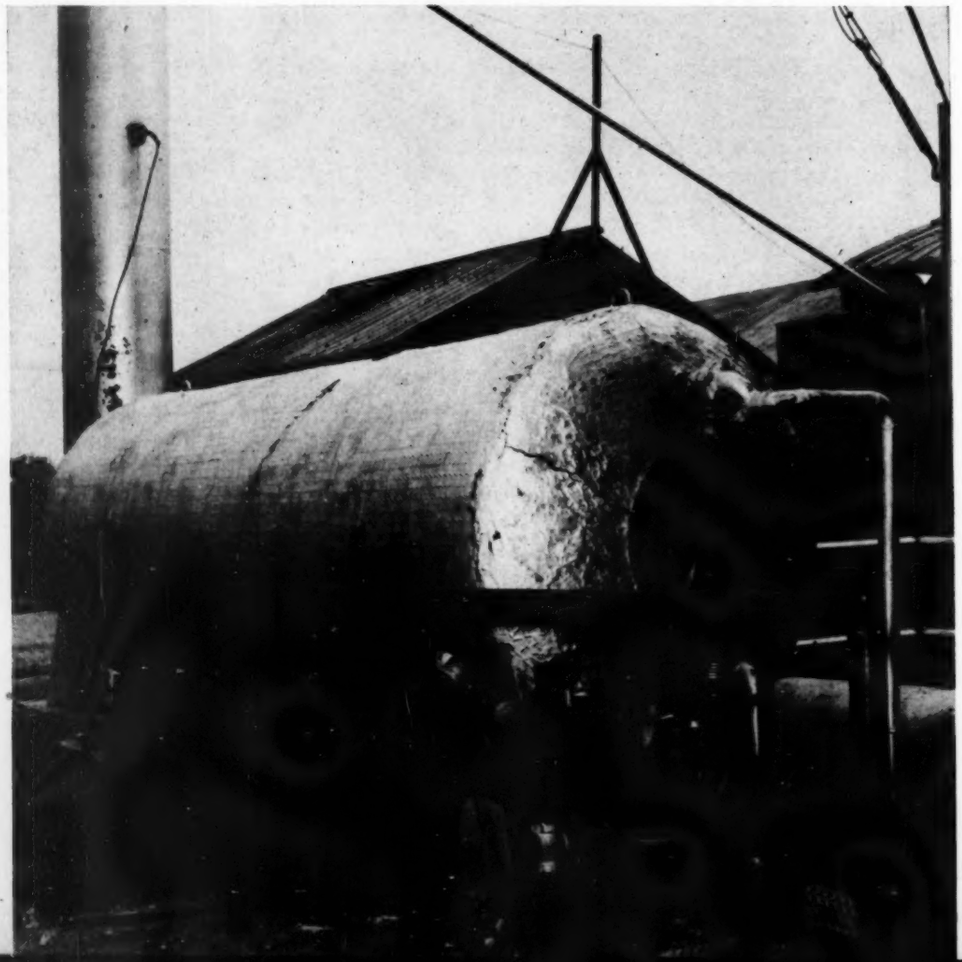
Experimental Well at the Duncan, Okla., Research Laboratories of Halliburton Oil Well Cementing Company Simulate Pressure and Temperature Conditions Anticipated in 20,000-Foot Wells.

MAN is so constituted that he can live only in the narrow range from slightly below sea level to an elevation of around 8,000 feet. By test methods he can explore the unknown, both above and below the earth's surface to ascertain the alterations needed, not only to support life but to enable a withdrawal of the products of nature.

The deepest mines in the world must be acclimated to become workable. The deepest oil wells need not be concerned with this, but the ever-increasing penetration of the earth's crust does present new problems.

The mechanical phase of drilling a well has been demonstrated down to a record depth of over 17,000 feet. Derricks and pumps and drill pipe have been built that are capable of greater depths. Casing and tubing will stand the strain, as will high-pressure control valves.

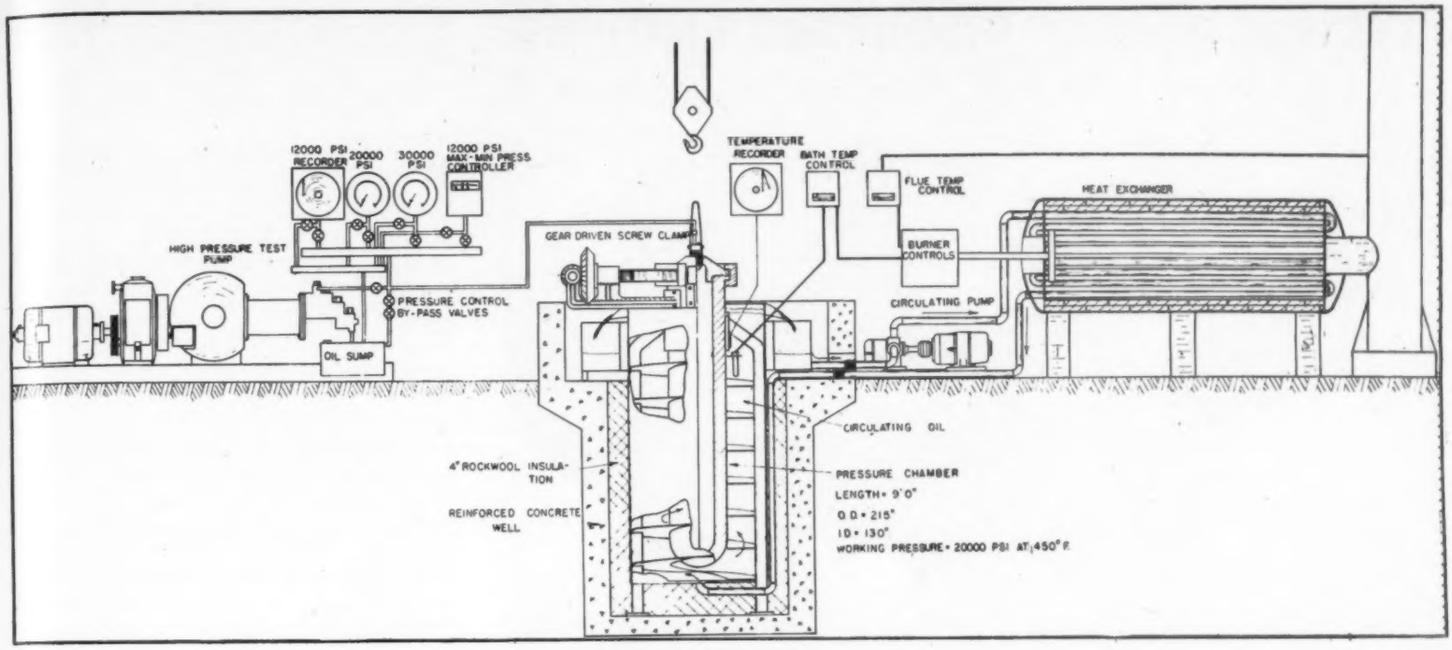
Problems involving cement and drilling mud must still be solved where temperatures are apt to be 300°F. or more. Also there are instruments and equipment used when drilling and completing a well that are affected by the high bottom hole temperatures and pressures encountered.



Temperature increases with depth. However, the locality for deep drilling will have a bearing on the bottom hole temperature encountered. The temperature of the above mentioned deepest well was not high for its corresponding depth. It is not at all improbable that 430°F. will be registered in the Gulf Coast area or California if a depth of around 20,000 feet is attained. Squeeze pressures in remedial cementing, together with the static load, could go as high as 20,000 pounds per square inch at the bottom.

Pressure, coupled with high temperatures, causes steel and rubber to perform differently from less extreme conditions. Clearances between metal parts are different. High pressures cause hard, tough rubber to flow like a viscous fluid. It is very evident that certain tools used in gun-perforating, testing, squeezing, packing off and even floating equipment as made previously will not function properly in such a medium. The degrees of mal-formation and changes are unknown and must be found.

Fig. 2—Gas fired boiler for heating interior of well.



Diamonds have been made under the same enormous pressures and temperatures that occurred during the cooling and shrinking of the earth. This was a simulated condition, produced by the ingenuity of man on a small scale.

It was not then considered impossible to design an apparatus that would duplicate the conditions to be found at the bottom of a well deeper than has yet been drilled. The shape and arrangement should accommodate the equipment to be tested. Pressure and heat would be applied. Recording instruments making a permanent record were necessary. All of the above with definite precautions for safety have been built and put into operation.

Figure 1 shows the well with the surrounding concrete bath covered with steel plate around the top of the forged steel interior. The steel cover is in place, and the large clamps with geared mechanism for closing it in may be seen. When in use, this is covered by a heavy metal cone-shaped guard.

Figure 2 is the boiler, gas-fired, with a circulating pump for the hot oil. The well can be heated to an inside temperature of 450°F.

Figure 3 shows the control panel with instruments, clocks, valve stems and, underneath, the high-pressure pump with its separate oil system for applying pressure to the inside of the steel forging that represents a well bore.

The back of this panel with its armor glass window is low alloy armor plate as a safety measure between the operator and the well. All operations are controlled from this point after closure of the well.

The schematic drawing connects the three components, and shows the plan and interior construction. The 4¼-inch cylinder wall of forged steel has a safety factor of four when used at 20,000 pounds per square inch internal pressure. The surrounding bath has a number of vanes to aid in circulation of hot oil to obtain a uniform temperature throughout the depth of the well. A special brand is used for this.

Pressure is applied through the cover of the cylinder with a small pump under the shelf of the instrument panel. This is a special-built, low-volume pump which has been tested to 30,000 pounds per square inch. A different type of oil is used for this purpose. Both pumps are electrically motor driven.

Perforating guns are tested, both for sealing properties around the barrel and bullet before shotting and for quality of powder. Sidewall coring devices that use a charge of powder come in this category. Premature explosions can occur at high temperatures. Effective velocity of bullets can be studied. Pressure seals on all well logging electrodes and equipment can be checked.

Floating equipment can now be put under the actual external conditions as found in a well rather than just subjected to internal pressure and temperature tests made in the open.

All tools using rubber, such as testing and squeezing packers, can be subjected to conditions that find the weak spots. Changes in design and quality of rubber and metal materials have already been found necessary.

Whether or not 20,000-foot wells are ever drilled, if materials and equipment are built to stand the required stress and strain, a larger factor of safety will be present when used at shallower depths. Improved performance should be expected in the more numerous 6,000 to 12,000-foot wells.

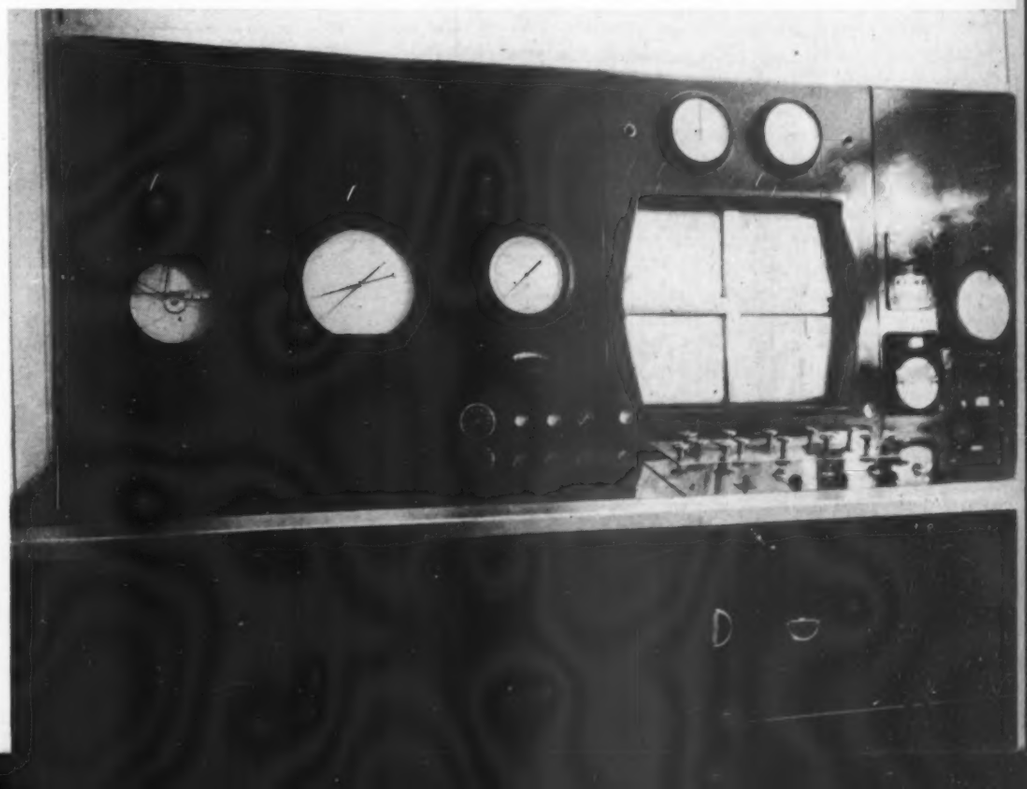


Fig. 3—Control and instrument panel for experimental well.

TRENDS IN RECIPROCATING ENGINES

Refueling the Fairchild "Packet" often referred to as the flying boxcar. With two Pratt & Whitney R 2800 engines developing 2,100 hp. each, the Packet uses 100/130 fuel.

By Eric Eltham

This is the second in a series of three articles dealing with trends in modern airplane power plants. The first article in the series was published in the July issue of World Petroleum.—Editor

TODAY when aircraft engineers are talking in terms of turbojets, turboprops, athodyds, pulse jets and rockets, any discussion of the reciprocating engine as applied to aircraft is apt to be considered superfluous. We are constantly being told the day of the conventional airplane engine is over, that all research on reciprocating engines has ceased, and that it is only a matter of three or four years before the commercial airlines will be carrying passengers in jet-propelled transports at speeds of 600 mph. or better. Jet propulsion for military aircraft is already a reality. Even rocket propelled military aircraft are streaking across the sky at speeds equal to or greater than that of sound. In Great Britain the Rolls-Royce Nene jet engine is now flying in experimental commercial airliners.

There is no denying that in the past eight years aircraft power plants have undergone a revolution. But what must not be lost sight of is the fact that these new sources of propulsion are not, at least in their present stage of development, improved substitutes for the reciprocating engine. Rather, they supplement the conventional engine by extending the performance of aircraft to speeds and altitudes that could never be reached by the piston engine. For aircraft flying at speeds below 300 mph, there is no engine that can equal the reciprocating engine in economy and flexibility, and since there always will be a place in the transportation scheme for such relatively slow aircraft, the reciprocating engine is going to be with us for a long ,long time.

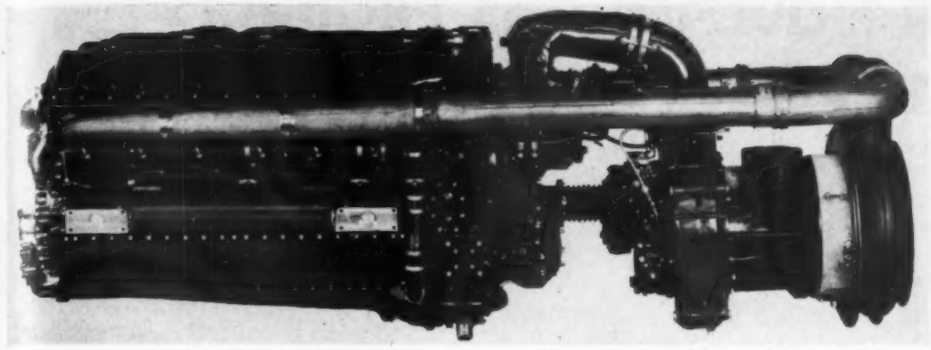
It is true that from now on the greatest amount of research will be done on jet engines. The piston engine has reached a high stage of development, and it is fairly safe to say that any further development will fall in the class of refinements. Just coming into service on the commercial airlines is the 3,500-horsepower, 28-cylinder Pratt & Whitney Wasp Major engine. This engine is one of the most complex reciprocating engines ever designed, with its seven banks of cylinders (four in each bank) arranged helically around the crankcase to ensure cooling, its 56 spark plugs, its seven duplex magnetoes and its 7.0:1 compression ratio. Within the next five years its maximum output will probably have been upped to 4,000 horsepower. It is the current version of this engine that will be calling on the petroleum industry to provide the airlines grade 115/145 aviation fuel toward the end of this year.

Granted, then, the piston engine will be with us for at least another 20 years, what form of evolution can we expect to see it go through? Looking first at the small engines of 65 to 190 hp. used in personal and executive aircraft, we see a lot of room for improvement. In many ways this is an economic problem governed by the law of supply and demand. Manufacturers have a backlog of engineering experience permitting them to design and construct vastly more efficient small engines, but to do this the cost would be prohibitive. For example, a 3,000 hp. engine weighs 1.16 pounds per horsepower, while an 85-horsepower personal plane engine weighs as much as 2.60 pounds per horsepower. Fuel consumption for the large engine is 0.42 pounds per horsepower per hour. A complete overhaul of these small engines is advisable every 500 hours. Superior and far more costly materials used in the large engines extend this overhaul period to 750 to 1100 hours. The only way the efficiency and reliability of this class of engine can be improved without serious increase in cost is by mass production techniques, and of course these are a function of demand.

Fuels for these engines usually have octane numbers of 73 or 80. Since this falls in the range covered by automotive fuels, the question often is raised as to why light aircraft cannot take advantage of the relatively low-cost automotive fuels. Two factors work against this. In the first case, the airport dealer has to have a higher margin than the service station operators because at the majority of fields under present traffic conditions his volume is low. Thus the cost differential is apt to become insignificant. A more serious difficulty to be overcome is that of vapor lock. Automotive fuels have a Reid vapor pressure of about 11 psi, while the highest that can be tolerated by aircraft is about seven psi. Perhaps fuel induction systems could be re-designed to handle the higher volatility fuels, but there has not been much indication of developments in this direction.

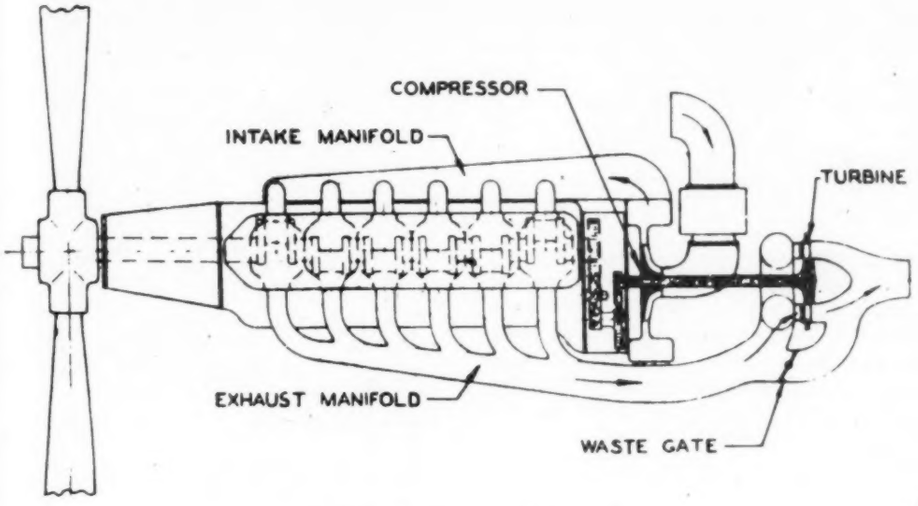
Temperatures in the low horsepower engine run considerably higher than in the larger engines. One reason for this is that these engines cruise at about 80 percent full power, while the larger engines only use 50 to 60 percent of their rated power when cruising. As a result, demands upon the lubricant used in the light engine are much more severe. Additive type heavy-duty oils have a potential application here, provided additives are employed that are not harmful to the bronze valve guides.

Developments leading to improved performance from the larger reciprocating engines will come about as a result of what might be called a marriage of this engine with the gas turbine. The



The Allison experimental compound engine V-1710-E27.

Pratt & Whitney R 4360 engine which develops 3,500 hp with water injection at take-off. There are 28 cylinders. Fuel is Grade 115/145.



Schematic diagram of compound engine.

resulting hybrid is known as the compound engine, an engine particularly adapted to the long-range bombers, photographic planes and transports the Air Force has under consideration. It would also be the most attractive power plant for long distance, non-stop commercial planes.

The principle behind the compound engine is that of recovering some of the energy wasted in the exhaust. When it is realized that almost 50 percent of the energy supplied by the fuel is dissipated through the exhaust, the desirability of tapping it is apparent. Looking at the problem another way, for every horsepower delivered to the propeller, 1.5 horsepower is discarded through the exhaust. Of course it is impossible to reclaim all this lost energy, but from 20 to 25 percent of it is theoretically available for useful work. A step in this direction has been made in the Convair-Liner, the newest commercial transport to go into service. In this plane the exhaust from the twin engine is fed into augmentors or ejectors which are simply jets that impart thrust to the plane. With this arrangement, the output of the engines is increased about 10 percent, and the only disadvantage is a somewhat higher noise level. Speed at sea level is increased by 10 mph. and the payload by 2000 pounds.

The compound engine is really an extension of the principle of the turbo supercharger used in conventional aircraft to compress air for high altitude operation. The supercharger is driven from a turbine powered by the exhaust, but the power available in the exhaust is so large that the supercharger can only absorb a fraction of it. Consequently considerable attention is being given to absorbing a larger proportion of this energy by the turbine which is then connected through gears to the propeller shaft. This is the compound engine. (See diagram).

Now, the turbine in the exhaust stream obviously increases engine back pressure, and as might be expected, the output of the reciprocating engine under these conditions falls off. At the same time, as the back pressure increases, the energy in the exhaust gases increases and consquently the output of the turbine increases. Since the output of the turbine increases more rapidly than the output of the reciprocating engine decreases with increasing back pressure, there is a point where the net horsepower of the combination is at a maximum. Tests with a compounded engine under simulated flight conditions have shown an increase in power output from 825 hp. to 1120 hp. or 36 percent. At the same time fuel consumption was reduced by 21 percent. It is this decrease in fuel consumption that makes the compound engine particularly attractive for medium speed, long-range transports.

Unlike the conventional reciprocating engine, the compound engine uses a minimum of fuel at high engine speeds. Engine friction is the factor which usually determines the optimum speed for minimum fuel consumption, but the characteristics of the turbine make speed the deciding factor. Compound engines will, therefore, cruise at maximum power, a condition that will enable the propeller to operate at maximum efficiency. At least three compound engines are under consideration in the United States. Most of the details of this work are not available for reasons of military security. However, it is generally known that our engineers are experimenting with the addition of turbines to existing engines. One of these is the Allison V-1710 engine used in P-51 fighters during the war. (See cut). Considerable work was done on this engine, but it was never test flown because it was felt the high exhaust gas temperatures (1950°F.) might cause failure of the turbine blades. This question of high temperatures at the turbine is the greatest problem facing the designers of compound engines and gas turbines. New heat-resistant alloys and ceramic coated blades are possible solutions.

Allison abandoned work on the compounded V-1710, but Wright Aeronautical has announced it is compounding the eighteen-cylinder 2,200-horsepower engine used on the Constellation. Several authorities feel that the greatest promise for compounding lies in the diesel engine. Ricardo in England has advocated a two-stroke diesel designed especially as a gas generator for the turbine. This proposal has the advantage that no detonation problems would be present, and high octane fuels would be unnecessary. Many abortive attempts have been made to adapt the conventional diesel to aircraft, and there is a very good possibility that the compounded diesel will be the answer. One reason for this is that the engine will be very small and consequently light. Whether the compound engine will use the spark ignition or compression ignition (diesel) principle is a question which is receiving a great deal of study. One thing is certain. The compound engine will only realize its full potentialities when it is designed as a complete unit. Real efficiency will never be realized by adding a turbine to an engine not designed specifically to generate gas for the turbine, and all that would be accomplished would be adding the complication of the gas turbine to the not inconsiderable problems inherent in this spark ignition engine.

DEMAND FOR LIQUEFIED GAS PRODUCTS STIMULATES PLANT CONSTRUCTION

IN 1947 there was an increase of 14 percent in liquid recovery from natural gas. This rate of increase has been accelerated in 1948 as new, postwar plants are coming on stream. The upward trend apparently will continue for several years to come because installation of recovery equipment is proceeding at a more rapid rate than at any previous period in the history of the industry.

There are 57 natural gasoline and cycling plants now in course of construction or authorized and planned for early completion in the United States. A recent compilation of Texas casinghead gas conservation projects showed 17 scheduled for completion between July 1, 1948, and December 31, 1949. An additional 22 were in the planning stage, with seven more under study or seeking a market for residue gas.

In actual volume the growth in output of liquids from natural gas during the past year was 16.3 million barrels. New plants scheduled for completion in 1948 will produce 35 million barrels of additional liquids, and in 1949 plants now scheduled for completion will add another 24 million barrels.

Large increases in the production of liquefied gases also are being made at oil refineries. The refinery products now being additionally recovered center largely in the C_3 and C_2 range for LPG and chemical uses. Most plants already were recovering most of the available C_4 fractions and blending a large part of the butanes with motor fuels, particularly in the fall and winter months.

It is not necessary to look far to find the causes for the building boom in light hydrocarbon recovery plants. Price is a powerful stimulant currently. The shortage of motor fuel is a strong factor in the building of natural gasoline and cycling plants which produce natural gas liquids in the motor fuel range. Not to be overlooked is the conservation program of the producing companies and the tougher attitude of the state conservation agencies, notably in Texas where processing and reinjection of casinghead gas to producing horizons is being encouraged or demanded.

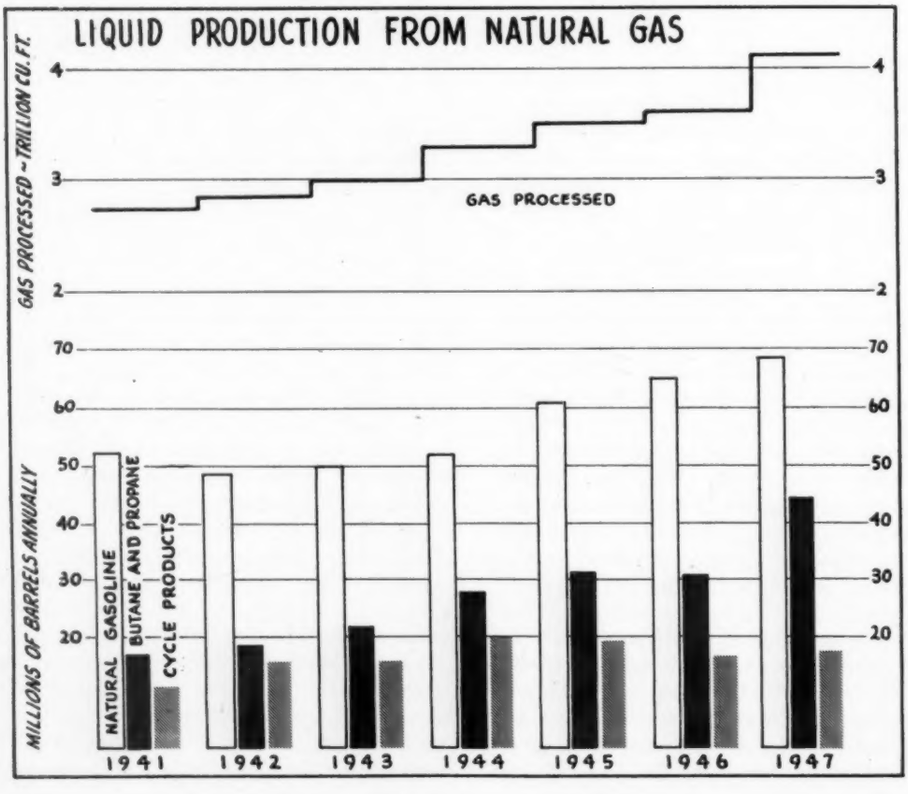
As a rule the oil companies are eager to adopt conservation programs which will permit a greater ultimate recovery of crude. This is exemplified in Oklahoma where a state law makes unit operation mandatory if a substantial majority of the operators favor pooling their properties for either primary or secondary recovery projects.

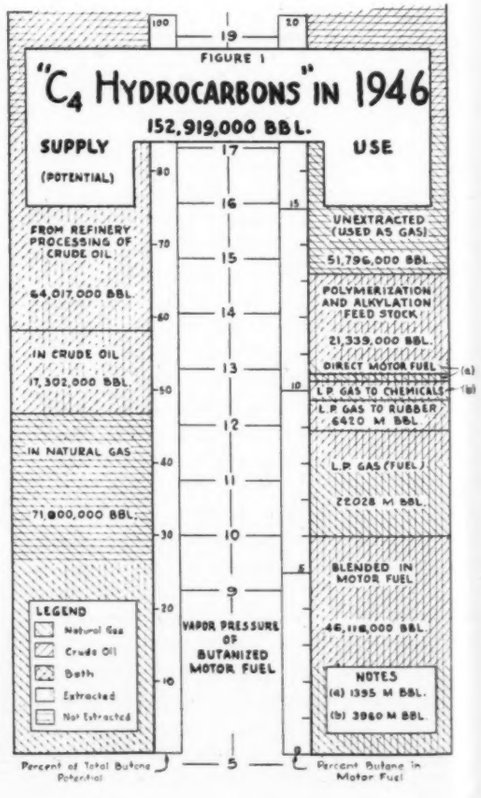
A report of the Texas Railroad Commission issued recently showed that 46 casinghead gas conservation projects had been completed between VJ Day and March 31, 1948. Residue gas from 20 of the plants was being completely reinjected into producing horizons. From five plants the residue was being partly sold and partly reinjected. Gas from the remaining 21 was being sold. Of the 25 plants under construction on March 31, it was reported that 11 would have a sales outlet for all of the residue, five for part of the residue, and nine would return the entire residue to the sand.

The current natural gasoline market plus the desire to improve ultimate recovery of crude oil is causing operators to reexamine smaller fields with a view to the installation of gasoline and repressuring plants. At the close of World War I the high natural gasoline price structure permitted the erection of small plants, but by 1930 the market was so low, both in cents per gallon and in ratio to crude oil and refinery gasoline, that only very large plants could be built economically. Most operators refused to go below 10 million cubic feet of one-gallon gas. Others would consider only much larger installations.

The average Oklahoma market for 26-70 gasoline in the five years before World War II was only three cents per gallon, and LPG prices averaged only about 2.5 cents per gallon in truck lots and was even less in large quantities for tank-car shipment. With 26-70 now bringing

Chart at left below is from annual address by C. R. Williams, president of the Natural Gasoline Association of America. At right chart showing butanes balance in 1946 is from a recent American Petroleum Institute paper by R. C. Alden and T. W. Legatski of Phillips Petroleum Co.





more than 10 cents per gallon and LPG prices similarly advanced, smaller plants are feasible.

Grimes Gasoline Company recently built a plant in the Cook field in Oklahoma to process two million cubic feet of gas daily and produce 8,000 gallons of total liquid product including the LPG mixture. Plants of the type developed by Grimes are said to be economic in today's markets with wet gas volumes as low as 150,000 cubic feet per day, providing the gas is rich enough. The March 1948 list of Texas plants recently completed and planned for early erection contains several with capacities below two million cubic feet. These small plants, of course, will not have the extraction efficiencies possible in the larger plants.

At the close of World War II there was a good deal of perturbation among gasoline manufacturers. Prices averaged about 4.5 cents for 26-70 during the war, up 50 percent from prewar, and it was feared that the market would return to its former low estate. It did fall some 40 percent in the spring of 1946 to 2.75 cents per gallon, but by late summer was back to 4.5 and by the end of the year it had risen to five cents. Since then the rise of another 70 percent has been steady, and there is a general feeling among manufacturers that natural gasoline will command a good price for several years.

History of the natural gasoline market for the past 30 years in which it has seen its principal growth is that natural brings good prices when crude is scarce and high, and that it goes begging when crude is plentiful and cheap. And, of course, the outlook now is for scarce crude as far in the future as the crystal gazers can peer. In the years immediately after World War I natural gasoline sold at a high percentage, often in excess of the price of house-brand motor fuel. From 1930 until World War II natural was down to less than 65 percent of gasoline. Now natural is bringing 80 percent of motor fuel.

While the market for pentanes and heavier seems assured, not everyone is as sanguine about the outlet for butanes and lighter. With gasoline manufacturers increasing their propane extraction efficiencies as well as their plant capacity, and with oil refiners installing propane recovery plants, there is a vast increase in the available supply of C_3 just around the corner. In 1947 LPG recovery from natural gas increased 34.1 percent, while production of pentanes and heavier increased 5.9 percent. Propane production as such was 70 percent greater than in 1946. At oil refineries the production of LPG increased 11 percent in 1947, and this year's increase will be much greater. Recent private surveys of LPG marketing organizations suggest that the available supply of propane will increase some 10 to 30 million gallons daily in the next year.

Before the last war it was uneconomic to design gasoline recovery plants for maximum propane recovery. General practice was to reach for 90-95 percent butane recovery and around 30 to 40 percent propane recovery. Since the improvement in LPG demand and market prices, manufacturers are finding it worth while to shoot for much higher recoveries.

At the recent natural gasoline meeting at Fort Worth two papers were presented dealing with methods of increasing propane recovery. G. W. McCullough, K. H. Hachmuth and A. J. Miller of Phillips Petroleum Company described a new process which is calculated to recover more than 99 percent of the butanes and 80 percent of the available propanes. The new Phillips process involves complete stripping of enough of the absorption oil to recover pentanes, partial stripping of the remainder by flashing at low pressures. The partially denuded absorption oil is introduced at midpoint in the absorber for selective absorption of the butane and propane fractions. The authors expressed the opinion that low-temperature liquefaction rather than absorption may be desirable in the future. The process would involve denitrogenation of the gas, and thus make the residue more salable to gas lines.

Z. C. Ambrose of Southwest Gas Producing Company described another method for 80 percent propane recovery. This latter process involves dehydration of the rich gas to prevent formation of hydrates, refrigeration of absorption oil and wet gas and the use of a low molecular weight absorption oil.

There is some controversy as to whether the LPG shortage last winter was a shortage of production capacity or a shortage of transportation capacity. In any case the industry now has excess producing and transporting capacity for a large part of every year. It is urging consumers to prepare for seasonal shortages by installing more adequate storage at the point of use. Greater storage at point of production is clearly uneconomic at today's prices when propane storage costs about 35 cents per gallon installed and butane storage is up to 25 cents per gallon.

Butanes are causing even more concern than propane, as may be inferred from the recent symposium on the subject at the mid-year meeting of the American Petroleum Institute's division of refining. This is true because butane is such an excellent motor fuel component up to vapor locking limits, and in time of oil scarcity it seems unfortunate that only 30 percent of the available supply can be used in motor fuel.

The butane excess has been growing for several years. The development of catalytic cracking at refineries has added C_4 fractions. Largely increased distribution of natural gas by pipeline has caused the erection of extraction plants on the "dry" gas and made more butane available. Also deeper sands are producing lighter crudes, and more rich gas containing butanes, and cycling plants in distillate fields are contributing more light products each year. Development of fuel systems which can utilize more, or preferably all, of the available butane both winter and summer is a concern of both refiners and gasoline manufacturers.

The extent of the seasonal variation in butane blending at refineries is illustrated by the experience of the Esso Standard Oil Company, as reported at the Institute meeting. This company uses 3.6 percent butane in its motor fuel or 8,000 barrels daily in summer and 10 percent or 22,000 barrels daily in winter. It is unfortunate that the peak demand for LPG coincides with the peak demand for motor fuel blending. Where chemicals or rubber are made from butanes, refiners can use their entire production the year around and must buy additional quantities on the seasonal market. No one has suggested that the chemical and rubber plants be operated only in the slack season for butane. This would be even more costly than storage which has been deemed uneconomic.

Chemical processes for conversion of butanes to liquids which can be included in gasoline are available but require large quantities of steel and cause a substantial energy loss. T. L. Apjohn and D. B. Heath of Socony-Vacuum Oil Company, Inc., told the refinery division of the Institute that energy efficiencies of the processes are about 80 percent. Energy loss by alkylation of isobutane and butylenes they calculated at 22 percent. Energy loss of catalytic polymerization of butylenes was placed at 18 percent, and thermal polymerization of the various C_4 fractions was estimated at 21 percent.

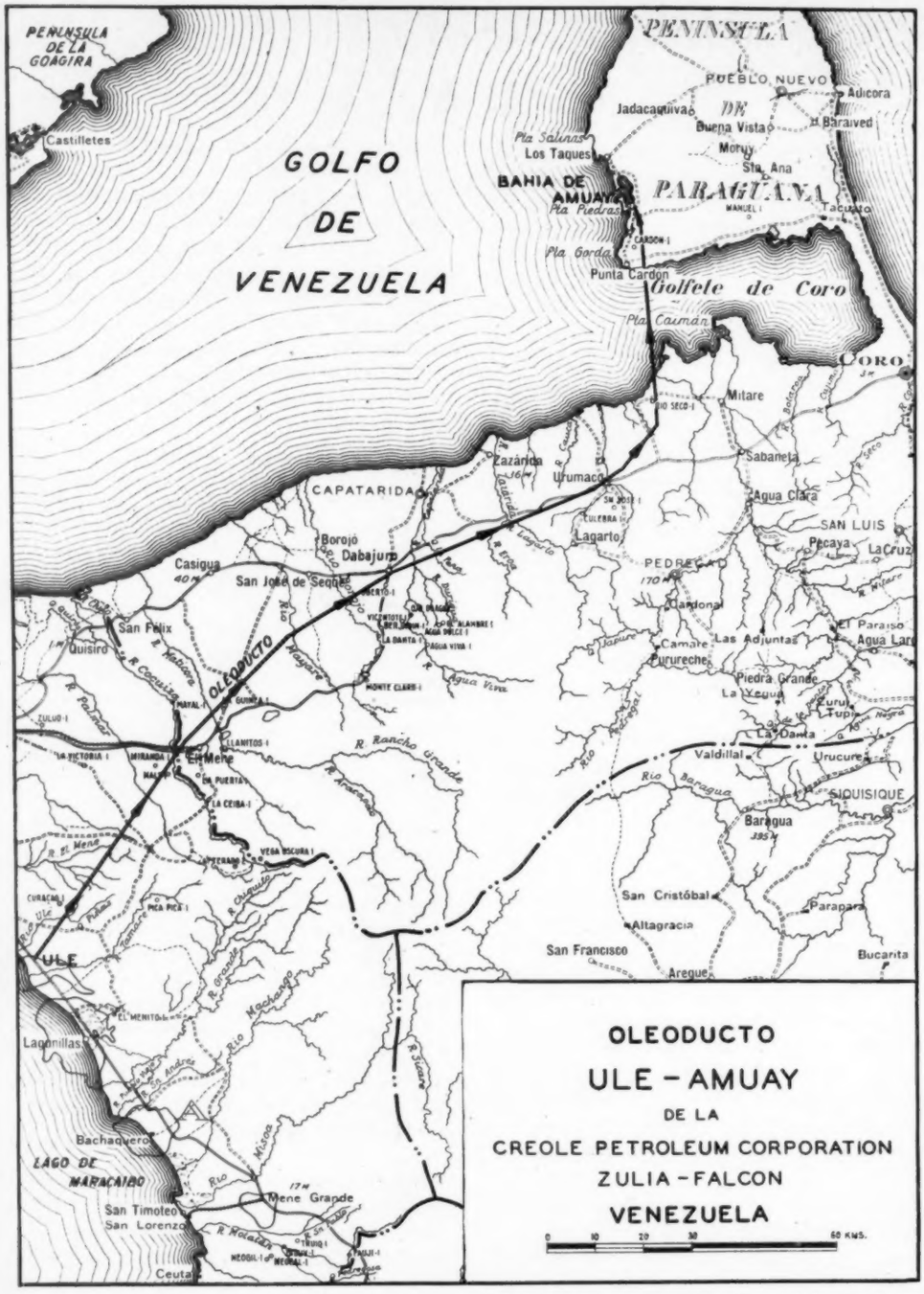
Inclusion of all the available butanes in motor fuel during the summer as well as winter would bring the Reid vapor pressure of the fuel to 20 pounds according to estimates of R. C. Alden and T. W. Legatski of Phillips Petroleum Company. This would increase motor fuel by about 13 percent and hence be equivalent to an added 600,000 barrels of crude oil daily. In their API paper Alden and Legatski presented Fig. I as a chart to show the potential supply of butanes in 1946, how the potential actually was used and the effect on motor fuel vapor pressure of adding various proportions of the potential.

The chart shows that only 30 percent of the potential found its way directly into motor fuel in 1946. Only 65 percent of the potential was liquefied, and of this quantity actually recovered 44 percent found its way into motor fuel, while 56 percent went to low value uses.

Potential butane supply was 8.8 percent of crude and was equivalent to 240 million barrels of crude at the 1946 gasoline yield ratio. The authors calculated that full motor fuel use of butane would in effect increase the United States crude reserves by 6,255 million barrels.

Whenever a proposal is made to introduce a radical change in the motor car or its fuel, there is always the difficulty of what to do with some 30 million cars on the road. They cannot use 20-pound motor fuel without vapor lock, so any changes made now in fuel systems cannot be made fully effective for several years to come. The natural gasoline industry feels very keenly about the matter and proposes to keep the question agitated until substantial results are achieved.

VENEZUELA'S

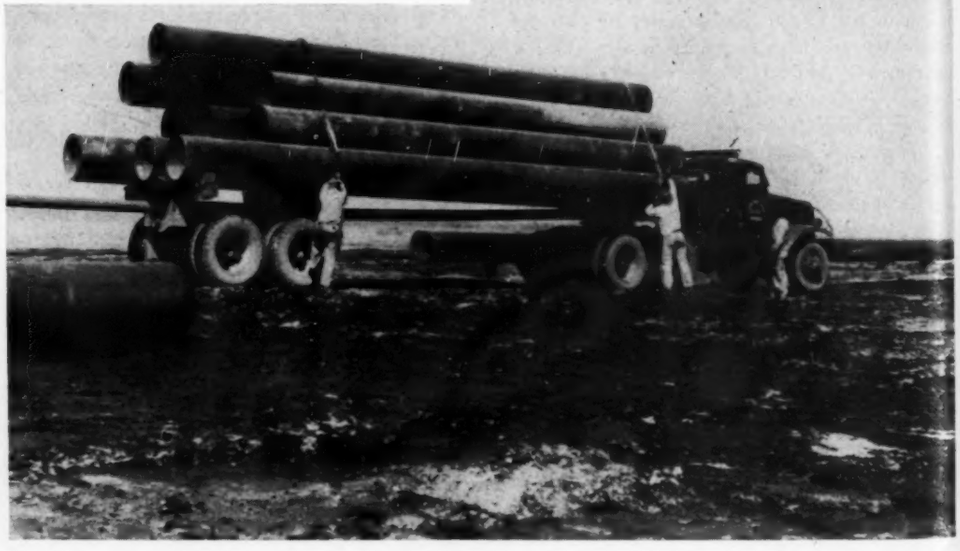


Map of new 24-26 inch crude line from Lake Maracaibo to Creole Petroleum Corporation's new refinery at Amuay Bay.

BY DECEMBER 1, 1948, Creole Petroleum Corporation, affiliate of the Standard Oil Company (N. J.), will be pumping crude oil through its new big-inch pipeline, which extends from Lake Maracaibo's eastern shore to the refiinery on western Paraguaná Peninsula, a distance of 231.6 kilometers (145 miles).

Magnificently modern, this pipeline enterprise, under construction since May 1, 1947, ranks with the world's best. It is second in length to the 252-kilometer, 16-inch Las Mercedes-Pamatacual pipeline of the Sociedad Anónima Petrolera Las Mercedes, but the 24 to 26-inch diameter of its pipe places it with the largest diameter pipelines ever built to transport oil.

Total cost of Creole's project is estimated at Bs. 110,000,000 ($33,000,000). The investment of this sizable sum is certain proof that the company believes bulk oil transportation via the pipeline to have economic advantages in the long run over other methods, especially since it guarantees a continuous flow of oil to the refinery. Over a period of years transportation costs will be lower and Venezuelan oil will be better able to compete with lower-priced crudes elsewhere. It argues that Creole has confidence in the continuing productivity of the oil fields of western



Unloading 26-inch pipe at Coro crossing during construction of the new crude line.

BIG-INCH LINE NEARS COMPLETION

By ANNE NEWMAN SUTTON

Venezuela. It drives home the fact that the oil industry is deeply concerned with the wise exploitation and conservation of the country's petroleum.

Williams Brothers Corporation is laying the pipe. Construction is progressing simultaneously from the two extremities of the line toward the mid-point at Dabajuro.

The pipeline begins at Creole's Ule tank farm situated about midway between La Salina and Lagunillas in the District of Bolívar State of Zulia. From its point of origin the line follows a northeasterly direction through the Districts of Bolívar and Miranda, then leaves Zulia to enter the State of Falcón where it continues its course past the small El Mene oil field, skirts along the southern side of the settlement of Dabajuro and thence north of the small Urumaco oil field. A short distance beyond Urumaco it swings to the north and crosses under the Golfete de Coro to the Paraguaná Peninsula and its destination at the Amuay Bay refinery site and terminal.

Its purpose, of course, is to pump western Venezuela's crude oil to the new refinery where, when the line and all its associate projects are finished, 60,000 barrels daily will be made into petroleum products and the remainder—some 240,000 to 265,000 barrels daily—put into storage tanks to be shipped to the world's markets. Heretofore oil from the Maracaibo Lake fields had to be moved to deep-sea terminals by shallow-draft tanker. The pipeline permits direct loading of ocean-going tankers.

It would seem that the project offered few construction problems because terrain crossed is relatively low, the highest point being only 139 meters above sea level. Also it is semi-arid country of sparse vegetation with cactus and scrub brush predominating. However, along the no-less-than 15 intermittent stream courses traversed, brush of a tropical nature was so heavy that it furnished a definite obstacle to construction, an important factor in clearing a right-of-way 30 meters wide over such a long distance and in laying pipe. Principal rivers being crossed, all subject to floods in the rainy season, are El Mene, Palmar, Cocuiza, Matícora, Borojó, Capatárida, Zazárida and Cadore.

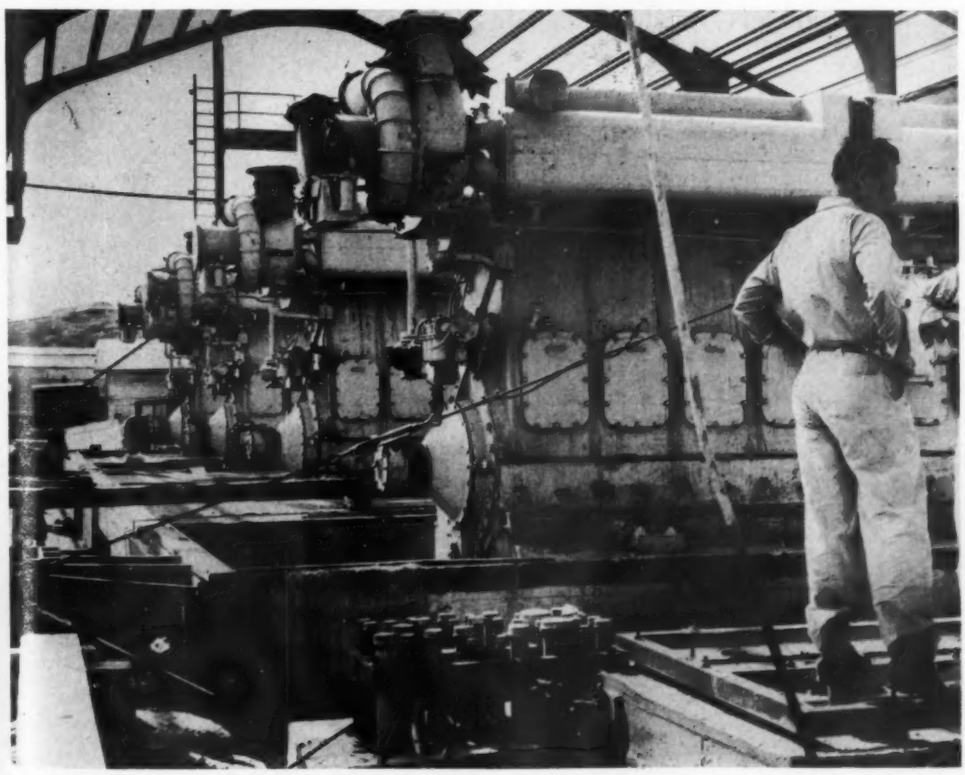
At river beds trestle-like bridges made from heavy pipe sections are being sunk into the ground and filled with concrete to serve as supports for the pipeline. However, the 600-foot wide channel of the Zazárida River will be crossed subterraneously. In a concrete-filled trench six feet below the riverbed, double-coated pipe will be laid. Extra coatings of protective material are also supplied where the pipe crosses marshy land. However, most of the terrain crossed is arid and the pipe simply rests on the ground.

Most interesting engineering problem perhaps is laying the pipe one meter below the bottom of the Golfete de Coro, which is no deeper than seven meters at any point along the pipeline's route. Being so shallow, it becomes very choppy and rough when winds are blowing. Here dredges will have to scoop a trench in the ocean bottom so that the pipe can be "put to bed", a labor made relatively ineffective in tumultuous waters by sand washing into the trench. To resist saltwater corrosion, this pipe will have a multiple-wrap enamel coating with an outside coat of gunite concrete. Pipe of one-half-inch wall thickness will be used.

One difficulty has been the supplying of materials to the central zone near Dabajuro since approximately 32,000 tons had to be loaded on barges at Amuay and trans-shipped to the beach on the coast of the Gulf of Venezuela. The complete lack of all-weather roads between Ulé and Amuay furnished another obstacle, especially when heavy trucks loaded with 10 joints of pipe each were traveling to the supply stations. Last but not least were the difficulties and delays in obtaining export licenses for the 65,000 tons of steel used on the line.

Placed as it is in a pathway cleared of vegetation, the pipeline is easily visible to company patrols who will inspect it every day for leaks or damage. Flow and pressure gages in the dispatchers' offices at the pumping stations register capacity and pressure drops such as might be caused by a leak. In this case the oil flow can be stopped by means of gate valves installed at regular distances. Similarly, at either end of the water crossing, sets of valves will be installed to take care of submarine pipe damage.

Pipe wall thicknesses will vary from three-eighths of an inch to one-half inch, depending upon the terrain and nearness to pumping stations. Likewise the pipe diameter, varying from 24 to 26 inches, is in accordance with computations for maintaining the right pressure and flow. Specifications call for sections of Grade B API steel line pipe beveled for welding. These are being supplied by the National Tube Company, subsidiary of the United States Steel Corporation.



Four 1,000-horsepower supercharged diesel engines used to drive 1,250 KW generators at the Amuay Bay power house.

Charles Adoue, experienced pipeline engineer in charge of the project, points proudly to the progress made in pipeline technology. "Years ago," he said, "I worked with 12-inch pipe and learned certain things. Later in handling 16 and 20-inch pipe, I discovered a change in pipeline behavior. I learned that increased diameters introduced new problems. The extreme rigidity of this 24 and 26-inch pipe has made it very difficult for pipe-laying crews to bend sections without damage. Another problem was stringing the two-ton pipe joints together."

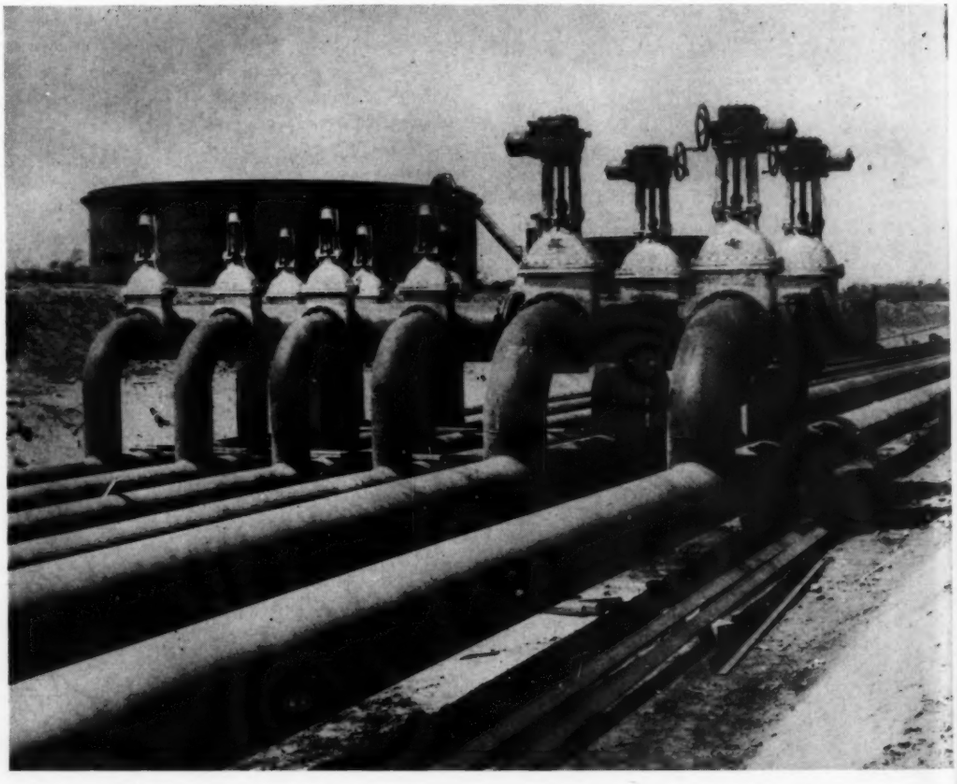
Two pumping stations are being constructed, one at Ulé and one just west of Dabajuro. The former is a concrete and steel building 90 meters long and 24 meters wide. In it are seven Worthington horizontal triplex double-acting reciprocating pumps, driven by seven 940 hp Cooper-Bessemer eight-cylinder gas-diesel engines. Each is capable of pumping 50,000 barrels per day at about 900 pounds per square inch. The oil flow will approximate walking speed which is, more or less, 5.6 kilometers per hour. Dabajuro's installations will be similar to Ulé's. Both stations will have their own electric power generation, their own offices, commissaries, employee housing and clubs.

Due to recent tank farm construction and expansion, Creole's available tankage space will be increased by 3,888,000 barrels by the time the line is completed. Eight new 150 by 48-foot floating-roof type steel storage tanks, each with a capacity of 150,000 barrels, have been added to the farm at Ulé. Three 120 by 48-foot cone-roof steel tanks, each with a capacity of 96,000 barrels are being built at Dabajuro. In addition to these is the farm at Amuay Terminal where 16 tanks with a total capacity of 2,400,000 barrels have been erected.

To insure safe and efficient carrier operation an elaborate modern communications system is being installed to join the stations and the terminal. This equipment, new to Venezuela, features a radio network consisting of five voice channels in the very high frequency range and three radio teletype channels.

Needless to say, Venezuela has been benefiting economically and will continue to benefit from the work entailed by this tremendous project. During the 19 months required to construct the pipeline system, some 900 to 1,000 men, mostly nationals, have been or are being employed, provisioned and provided with transport. It is estimated that 125 men, for whose families adequate housing must be provided, will be needed permanently to operate the line when completed. The Creole Petroleum Corporation has purchased from local business concerns sand, gravel, lumber and other materials. In other words, most of the initial pipeline expenditure is going back to Venezuelans in materials and labor costs. Not only will the refining industry at Amuay Bay be made secure, but populous settlements will spring up all along the line making progressive and up-to-date another of the country's hitherto neglected wastes.

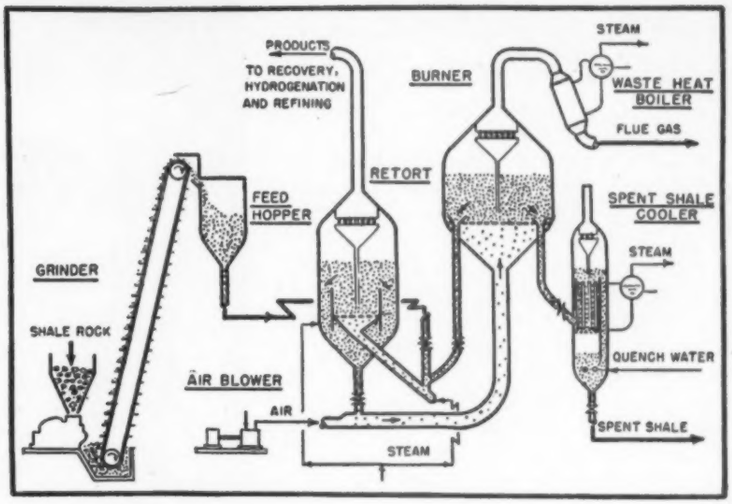
Pipe line right of way from Dabajuro to Coro Crossing.



Tank farm manifold at Ule. At left are four 16-inch lines and at right two 24-inch lines all with motorized valves.

Statistics show that the oil industry has constructed 1567 kilometers of pipelines in Venezuela. Of these, Creole has completed 207 kilometers and shared in the construction of an additional 357. The Socony-Vacuum Oil Company of Venezuela has a 161-kilometer, 12-inch line capable of moving 50,000 barrels daily, and the S. A. Petrolera Las Mercedes has a 16-inch diameter pipeline, 20 kilometers longer than Creole's, capable of carrying 60,000 barrels daily. Another interesting fact and little-known is that pipelines in general deliver a large percentage of the total freight moved by all types of transport. Thus Creole's new line will carry 42,857 metric tons of oil daily, or almost as much cargo as the port of La Guaira handles in an entire month.

The fluid shale-oil retorting process.



OIL FROM SHALE

BESIDES its projects for producing synthetic oil from coal, the Bureau of Mines is deeply engaged in research and development work on the production of oil from oil shale, particularly from the enormous beds of shale in Colorado which are more than 500 feet thick and average 15 gallons of oil per ton. It appears that Colorado alone has enough oil shale to yield about 200 billion barrels of oil. The Bureau now has two oil shale mines and a demonstration shale oil plant near Rifle, Colorado. These mines produce oil shale at the rate of 25 tons per man-day, with the expectation of raising this to 40 to 50 tons per man-day in 1949. A crushing and retorting plant is in operation and daily produces about 50 barrels of oil. By a relatively simple refining process, this oil yields a product that will serve as a No. 6 or No. 5 residual fuel. But to make light distillate fuel, the crude oil has to be subjected to a deeper refining which will require the development of special methods. For this purpose the crude shale oil is being shipped to some half-dozen refineries that have agreed to cooperate in this work. The principal operation of refining shale oil is to subject it to a hydrogenation that converts it to the equivalent of a natural crude, after which it may be put through conventional refining processes.

Aside from the problem of reducing mining costs to the lowest possible level, the incipient shale oil industry has still before it the problem of finding an inexpensive method of retorting the shale to obtain the oil. Several types of retorts are under study, but the problem has not been finally settled. The Union Oil Co. of California, has a design that appears promising. The Standard Oil Development Co. has been working on this problem for some time and has designed a two-vessel process which—as might be expected—is based on the fluidized-bed principle in which a portion of the organic residual carbonaceous material of the spent shale is burned to raise the spent shale above the retorting temperature; this hot inert material is recirculated to the reactor in accordance with the known fluidizing

Thirty-five tons of spent shale being dumped at the Rifle, Colo., oil-shale demonstration plant of the United States Bureau of Mines.

Truck road which climbs 2,200 feet in five and a half miles from the Rifle, Colo. demonstration plant to the shale mine.

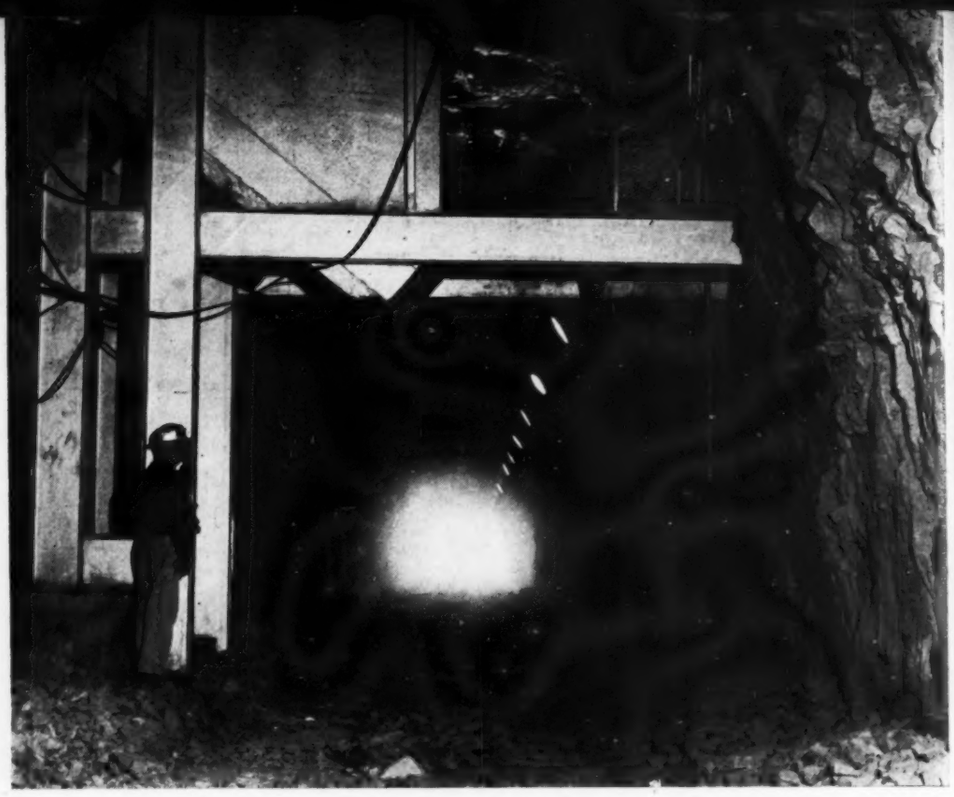
technique of catalytic oil cracking to expel oil from the fresh shale.

According to the latest information (June 7) from the Bureau of Mines, the estimated cost of producing crude shade oil, based on processing a 70-foot oil-shale bed yielding 30 gallons (0.7 barrel) per ton is $2.00 to $2.50 per barrel. Of this, $.70 represents the present cost of mining the shale, and $1.30 to $1.80 per barrel of oil covers the costs of crushing and retorting the shale. The Bureau states (June 7) that a mining cost of $.50 a ton seems reasonable of attainment on a commercial scale. If this is done, the cost of crude shale oil will come down to between $1.80 to $2.30 per barrel. (On May 29 crude petroleum of 25 API gravity from the Gulf Coast was quoted at $2.56 per barrel.) Although crude shale oil is of a lower refining quality than Gulf Coast crude, these figures do not indicate a great difference in real costs of the two materials, and it would seem that shale oil should at least cost no more than oil from coal.

The real handicap of shale oil is the geographic situation of the richest oil shales, which are located in difficult mountainous territory remote from consuming centers and deficient in water supply. But even so, the prospect of oil from shale has become of considerable interest to the Pacific coast regions, where the prospect of an ultimate shortage of natural crude is more imminent than in other districts. The Union Oil Co. of California, the Sinclair Refining Co., Shell Development Co., Socony-Vacuum Co., and Standard Oil Development Co. have been especially active in helping the Bureau of Mines in its work on oil shale, with special reference to the future needs of the Pacific coast. The first bulk shipment of crude shale oil is now undergoing refining tests by Universal Oil Products Co. at Riverside, Illinois.

According to E. V. Murphree of the Standard Oil Development Co., the estimated relative costs of producing liquid fuels from crude oil, natural gas, coal (in the east) and oil shale, as of February 25, 1948, are as shown in the accompanying table.

Murphree assumes that it will cost $1.00 a ton to mine oil shale; if this is reduced to $.50, the cost of gasoline from shale oil should be distinctly less than oil from coal.



Haulage addition in the oil shale mine at Rifle.

Summary of Approximate Estimates on Production of Fuels

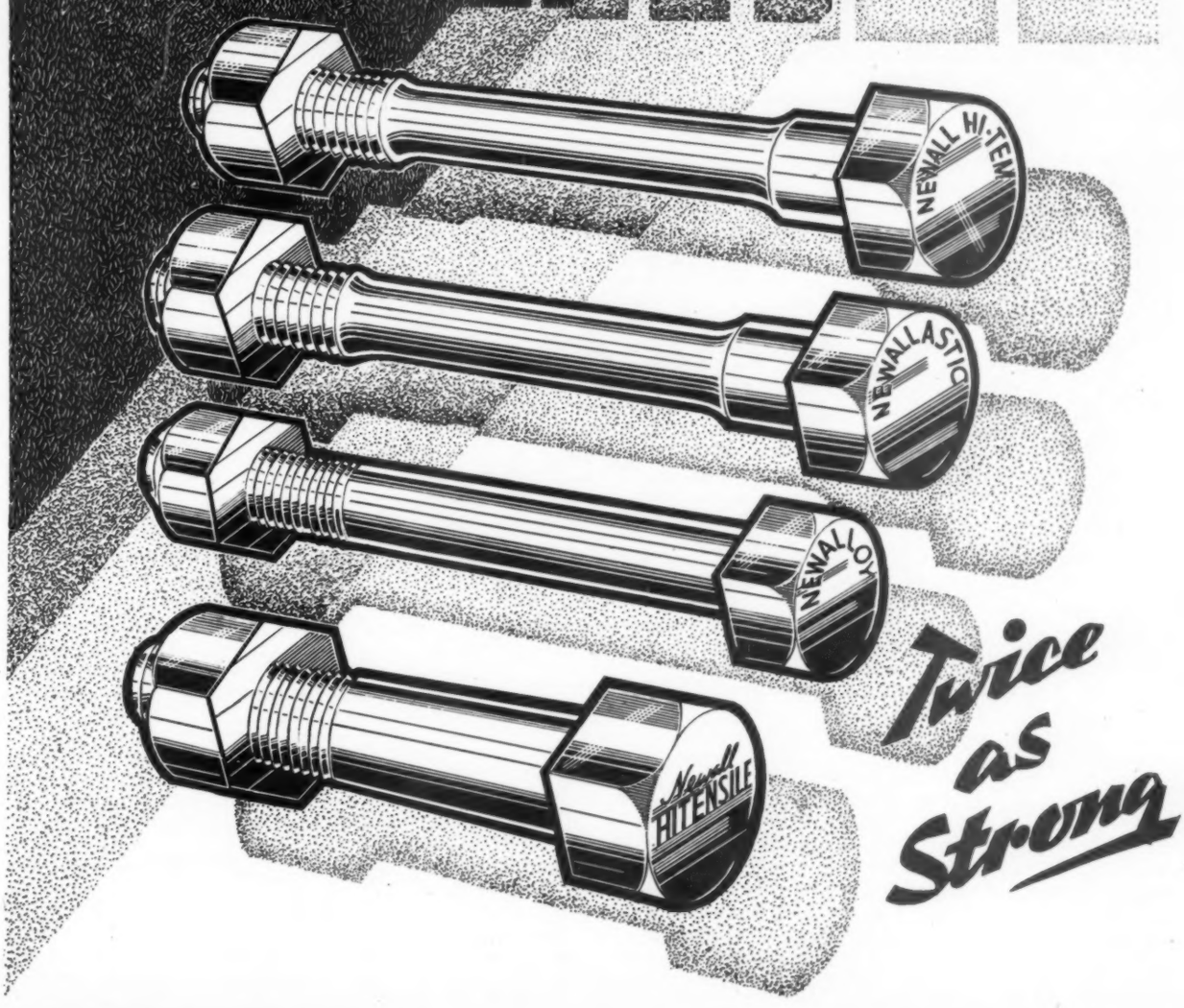
Raw Material	Crude Oil	Natural Gas	Coal (In East)	Oil Shale
Investments				
a. For max. distillate yield $/B/D oil products	4300	7400	7600	6100
b. For max. gasoline yield $/B/D gasoline	6500	8200	8500	8400
c. Possible housing investment $/B/D gasoline (for max gasoline yield)			2900	900
Steel Requirements				
a. For max. distillate yield Tons /B/D oil products	5.7	7.-	4.6	5.7
b. For max. gasoline yield Tons /B/D gasoline	7.8	7.9	5.2	7.4
% Gasoline in total liquid products Max. gasoline case	87	90	89	87
Raw material price assumed or estimated	$2.78/B*	10c/MCF*	$3.20/ton	$1.00/ton
Gasoline costs for max. gasoline yield—c/gallon				
Raw material	8.8*	2.9*	3.9	4.2
Manufacturing less credits	4.3	8.9	12.7	11.8
Product transportation	1.0	1.0	—	—
Total	14.1*	12.8*	16.6	16.0
Added cost for housing if required	—	—	1.9	0.6
Effect of increase in raw material cost	$1/B adds 3.2c/gal	10c/MCF adds 2.9c/gal	$1/ton adds 1.2c/gal	$1/ton adds 4.2c/gal
Effect of 10% return on investment in Manufacturing or	1.6c/gal	3.7c/gal		
Manufacturing plus mining			5.6c/gal	5.5c/gal

* These figures are based on crude oil and natural gas prices and not on costs.
Note: The investments and costs in the table are for a considerably higher octane number gasoline than present premium grade gasoline. The gasoline octane number level used for the estimates will about satisfy a 10 to 1 compression ratio engine which is capable of giving about 30% more miles per gallon than present day engines. It was felt that this quality gasoline may be required at the time there is any large production of synthetic gasoline since the use of such engines. This saving of gasoline will in itself will be an important conservation measure.

Electric shovel loading shale into truck in the underground quarry.

Left to right: retorts, crushed shale storage bins and crusher building. All photographs with this article from U. S. Bureau of Mines.

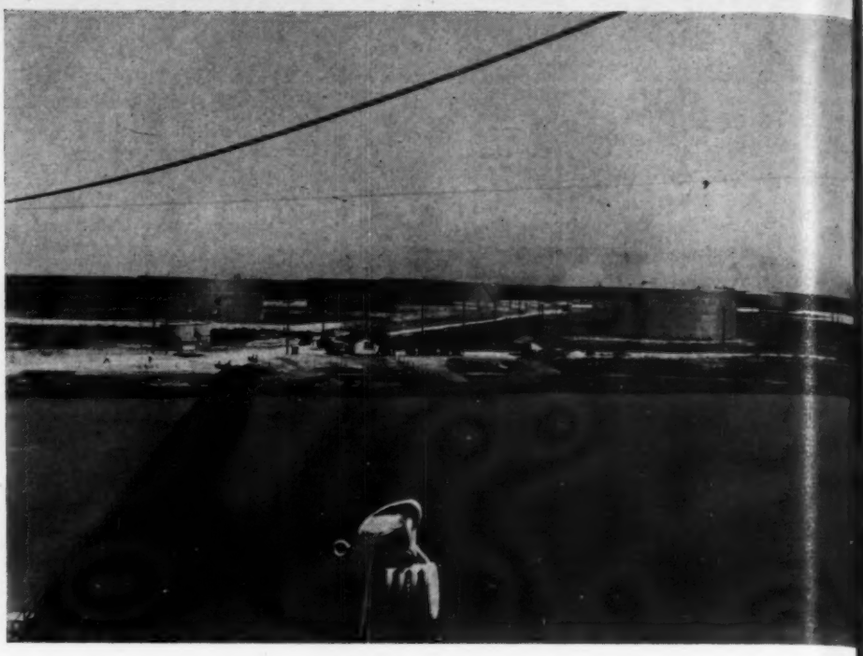
NEWALL



Twice as Strong

A.P. NEWALL & CO., LTD. POSSILPARK GLASGOW N

Army "Sea Mule" used by Sun for handling tankers in port at the new Ingleside, Texas, terminal.



Sun's loading terminal where crude oil from 23 fields is assembled for shipment to Marcus Hook, Pa.

SUN'S NEW GULF COAST TERMINAL

FOR the more convenient handling of the crude oil collected from the twenty-three fields it serves, the Sun Pipe Line Co. (Texas), subsidiary of Sun Oil Company, has developed a deepwater terminal at Ingleside, Texas. A ship channel was dredged to a depth of 36 feet, permitting ocean tankers to come alongside the berthing dock.

The wharf is built of steel sheet piling of T-head coffer dam type construction, 145 feet long by 35 feet wide, completely filled with sand and topped with road dressing. Additionally there are two steel caisson-type mooring clusters, one at either end of the T-head.

The T-head is reached from shore by a steel and timber runway extending into the bay some 700 feet where a dredged turning basis, triangular in shape and 38 feet in depth adjoins the deepwater channel from Corpus Christi to the sea. The ships will lie adjacent to the ship channel and with the aid of tugs can cast off their lines and proceed independently from that point. This T-head will easily accommodate the largest vessel.

Storage facilities consist of seven tanks with an aggregate capacity of 917,000 barrels. Three of these are pontoon roof tanks of 131,500 barrels each supplied by Chicago Bridge and Iron Company. Four cone roof storage tanks of 131,500 barrels capacity and two 27,400-barrel cone roof fuel oil tanks were constructed by Bethlehem Steel Company.

The terminal's pumping station is equipped with three electrically-driven centrifugal cargo pumps, each capable of delivering 7,500 barrels an hour through two 16-inch cargo loading lines. An additional centrifugal transfer pump will be used in moving oil about the farm.

All modern type appurtenances have been used on shore as well as on the wharf, such as electrically operated master control gate valves, air operated winches and hoists and patented swivel joints on the hose connections. The 16-inch cargo loading lines can supply the ships at any rate from 1,000 barrels per hour to 20,000 barrels an hour. In an emergency due to power failure, gravity loadings can be accomplished at a rate of 7,000 barrels per hour.

Facilities have been installed to take the ballast from the ships on arrival and to supply ships with bunker fuels and fresh water. The entire farm has been enclosed in a cyclone fence with roads constructed along the outside of the property to enable vehicles to proceed from the end of the runway to the neighboring towns without going through the tank farm proper.

Crude oil handled at Ingleside is transported to the terminal via 244 miles of main trunk line, the pipe ranging in size from four to ten-inch.

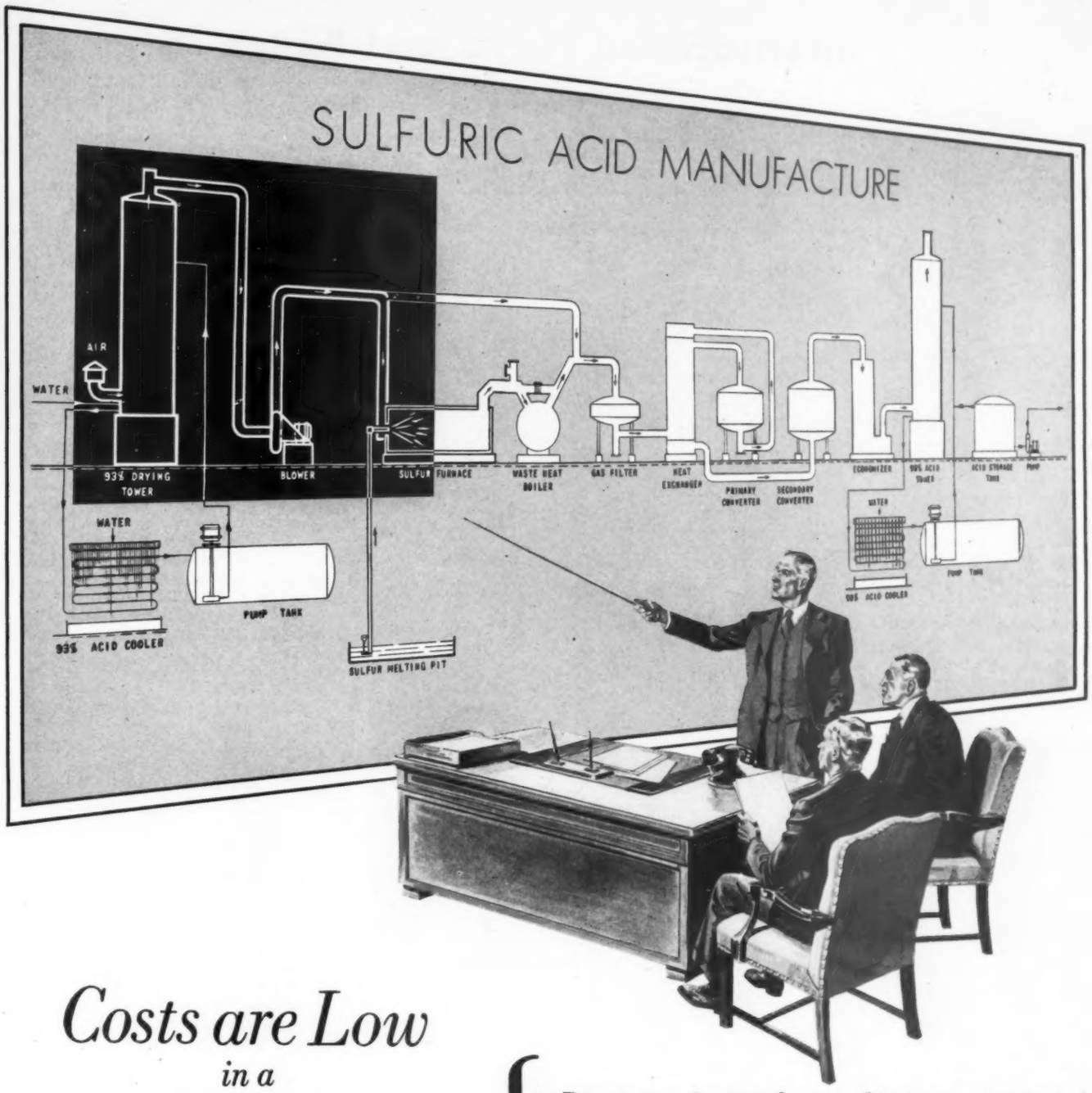
An unusual feature in the equipment of the terminal is the use of converted Army Sea Mules instead of ordinary type tugboats for handling tankers in port. They were devised as an experiment to obviate costly delays in the delivery of regular tugboats. Purchased at San Diego, California, as war surplus, the "mules" were trucked overland to Corpus Christi, Texas, and reconverted there. While the craft present a peculiar appearance judged by conventional nautical standards, they have plenty of power and handle visiting vessels without difficulty. Being on the job 24 hours a day, it is believed they will save time and money for the company.

Each of the "mules" consists of four original units welded together. The two forward units were pontoons. These pontoons have been welded together side by side. The interiors contain gasoline tanks and storage space. The two after units were "tractors" and are powered with 150HP Chrysler marine engines. The "tractors" were then welded to the pontoons. The outsides of both tractors and pontoons are flush, and this leaves a tunnel between the tractors extending aft to the stern. The tunnel helps keep the boat on an even keel while under way. The deck over the engine-room has been raised 10 inches to allow more headroom.

The gasoline tanks in the pontoons carry 750 gallons of gasoline each. This gives a total of 1500 gallons of gasoline for each "mule" and total of 300 HP. The gasoline engines are cooled with fresh water which is forced through a heat exchanger into which there is a continuous flow of salt water.

The propellers (one for each engine) are 52/40's with a 9:1 ratio and a speed of 220 rpm. This dual propeller system assures greater and easier maneuverability. Engines can be run at different speeds or one engine can be reversed while the other is going ahead.

Important in the design is the overhang of the deck at the stern. Without this feature there would be a tendency, under the drive of the powerful engines, for the bow to rise and the stern submerge. This overhang or "fantail" offers resistance against the turbulent wash of the propellers. The up-thrust of the wash against the overhang tends to raise the stern, thus keeping the vessel on even keel. Each of the mules carries a complement of two men.



Costs are Low

in a

CHEMICO BUILT CONTACT ACID PLANT

The use of pure U. S. sulfur is common practice in modern acid plants. In a Chemico contact acid plant, the pure sulfur is burned in the presence of *pre-dried air* . . . a method which permits these important cost-reducing benefits:

- ***Recovery of waste heat as high pressure steam***
- ***Simplified design and construction***
- ***Iron and steel construction throughout***
- ***Reduced investment***
- ***Reduced maintenance***
- ***Reduced operating manpower requirements***
- ***Reduced product cost***

Chemico Plants are profitable investments

CHEMICAL CONSTRUCTION CORPORATION

EMPIRE STATE BLDG., 350 FIFTH AVENUE, NEW YORK 1, N. Y.

EUROPEAN TECHNICAL REPRESENTATIVE
CYANAMID PRODUCTS, LTD., BRETTENHAM HOUSE, LANCASTER PLACE, LONDON W. C. 2, ENGLAND

EUROPEAN LICENSEE OF N. E. C. PROCESS
HYDRO-NITRO S. A., 8 QUAI DU CHEVAL BLANC, GENEVA, SWITZERLAND

CABLES: CHEMICONST, NEW YORK

International News and Notes

Independents Win Kuwait Concession

According to an announcement made in London by Ralph K. Davies at the end of June, the American Independent Oil Company of which he is president has received a concession for oil exploration and development from Sheik Ahmad al Jaber al Subah of Kuwait. The concession covers the small region about 50 miles square located on the western side of the Persian Gulf between Kuwait and Saudi Arabia. The district has no permanent population. In the readjustment of territorial boundaries following World War I its ownership remained in dispute between the Sheik of Kuwait and King Ibn Saud of Arabia. The controversy was settled a few years ago by an agreement that each should have a half interest.

The concession granted by the ruler of Kuwait, therefore, applies only to his half interest in the neutral zone. Oil rights in the territory of Saudi Arabia are held by Arabian-American Oil Company, but it is reported that that company and King Ibn Saud are willing to make an arrangement that will enable American Independent to operate throughout the neutral area. It is considered possible that an agreement will be made by which Aramco will handle the actual work of exploration and development.

It is reported that the concession to American Independent calls for the payment of $2.50 a ton or roundly 35 cents a barrel to Kuwait as royalty. There was spirited competition for the contract, and it is stated that eight different groups submitted offers. The attractiveness of the zone to investors is that it is flanked on the north by Kuwait and on the south by Saudi Arabia, both of which possess large and prolific fields. Since similar formations exist in the intervening area, the prospect of finding oil in quantity is considered far above the average for unexplored territory.

"In negotiating this concession," said Mr. Davies in his announcement, "American Independent feels that it has written a forward-looking and significant chapter in the history of oil development in the Middle East. It is the first time a large-scale, adequately-financed oil operation has been undertaken by independents. With the transformation of the United States from an era of oil plenty to one of shortage, and with the shift to dependence on foreign petroleum, the absence of a strong independent element abroad raised an issue of immediate and direct interest to both the petroleum industry and the public generally. "In the new world oil era that is upon us, it behooves the entire industry to adjust to the realities of the times. 'Competitive rivalry' and 'free enterprise' must not become mere words in the oil man's lexicon. If the petroleum industry, as we have always known it, is to survive, the independent must make every effort to find his place in world oil production."

American Independent Oil Company is made up of a group including Allied Oil Co., Ashland Oil and Refining Co., Deep Rock Oil Corp., Globe Oil and Refining Co., Hancock Oil Co., Phillips Petroleum Co., Signal Oil and Gas Co., Sunray Oil Corp., J. S. Abercrombie Co. and Ralph K. Davies.

Named Sigmund Pumps Director

G. R. Glendinning, F.C.I.S., has been appointed to the board of directors of Sigmund Pumps, Ltd., Gateshead, England. Mr. Glendinning has been with Sigmund Pumps for some 11 years as assistant secretary and secretary. He will now combine the duties of secretary and director. He is the first employee of Sigmund Pumps to be appointed to the board.

William K. Whiteford

Whiteford Made Bank Director

William K. Whiteford, president of British American Oil Company Ltd., of Toronto, Canada, and of British American Oil Producing Company of Tulsa, Oklahoma, has been elected a director of the Bank of Nova Scotia, one of the seven national chartered banks of Canada, with offices also in Great Britain and the West Indies.

Mr. Whiteford is a native of Los Angeles, California, and studied engineering at Stanford University. He is active in the American Petroleum Institute and the American Institute of Mining and Metallurgical Engineering.

Plan to Push Trans-Arabian Line

Construction of the Trans-Arabian pipeline will be pushed to completion as rapidly as possible, it was announced July 22 after a meeting of the board of directors in San Francisco. The announcement was made by W. S. S. Rodgers, board chairman, and B. E. Hull, president.

Shipments of steel pipe have been suspended temporarily because of the Department of Commerce ban on pipe exports. However, the Department stated that Tapline's export license applications would be considered again in September. Rodgers and Hull stated after the meeting that current applications were on file and that subsequent requests for export licenses would be made to cover shipment of the remainder of the steel necessary to complete the line.

"We are still laying pipe in Saudi Arabia and will keep crews in readiness to speed up construction as soon as more pipe is available," Hull said. "Seventy miles have been laid, and we have enough steel pipe to put another 168 miles in place. Much less steel will be required to complete this line than would be necessary to construct tankers that could carry an equal amount of oil. Less time will be needed to complete the line than to construct tankers of equal capacity, and the savings in time and steel will be important considerations in getting Arabian oil into markets where it is vitally needed."

Hull said that 238 miles or 53,587 tons of steel had been shipped to Saudi Arabia for the first sections of the line. Completion of the route requires 832 more miles or a total of 208,890 additional tons of pipe.

"The capacity of the line when completed," Hull said, "will be 300,000 or more barrels per day of oil transported from the producing fields of Saudi Arabia to the Mediterranean. Transportation of 300,000 barrels per day from the Persian Gulf to the Mediterranean would require 62 T-2 type tankers. To build that number of tankers would require 322,000 tons of steel. We need only about 209,000 tons of steel which would build only 40 tankers."

Pipe manufactured for the Trans-Arabian is being diverted temporarily to the Tennessee Gas Transmission Company for increasing deliveries of gas to the eastern United States.

The board re-elected officers in all cases except that R. G. Follis replaced H. D. Collier as vice chairman, and C. L. Harding was elected a director, succeeding Brewster Jennings.

New Arabian Field

A fifth important oil field has been discovered in Saudi Arabia at Ain Dar, 27 miles west of the Abqaiq camp. The discovery well was drilled in late June and, although it has not been fully tested, enough is known to indicate that it will be an excellent producer.

Ain Dar is the lowest of several large domes in a north-south trend of folding, roughly parellel to the previously proven producing fields. Examination of cores shows that oil is coming from the same formations which have been so prolific in the more easterly trend. Arabian American Oil Company officials view the discovery as being an important contribution to world oil reserves.

World's Largest Oil Line Pumps

Two 14 x 16 two-stage Byron Jackson pipeline pumps will soon be delivered to the Arabian American Oil Co. for the first station on the Trans-Arabian pipeline. One unit will handle the entire capacity of the line; the other is a spare.

These pumps, operated at 3600 rpm by 6000 hp steam turbines, will start crude through the 1050 mile long Trans-Arabian pipeline. Each pump is designed to handle 400,000 barrels per day against a pressure of 800 psi. At five subsequent stations along the line, four BJ single stage pumps in series, driven through gears by giant diesel engines, do the same job as one of these units operating alone. A fifth unit serves as a spare.

Klinger FITTINGS—

REFLEX LEVEL GAUGES, SLEEVE-PACKED COCKS, AND "KLINGERFLOW" PISTON VALVES

in use on Polymerisers

(Photo: Courtesy British Resin Products Ltd. Tonbridge)

Note: The special type Klinger Reflex Gauges shown are for storage tanks and vessels where pressures are low or moderate. The reflex glasses give unmistakable indication of liquid level and make it unnecessary to install guards or protectors. The connecting flanges are cast solid with the backplate, and no shut-off or drain cocks are needed.

RICHARD KLINGER LTD

KLINGERIT WORKS • SIDCUP • KENT • ENGLAND

OIL COMPANY STAFF CHANGES

R. L. Kidd

ROBERT L. KIDD has been elected a vice president of Cities Service Oil Co. He is a member of the board of directors and manager of the company's land and geological division. He is also a director of Cities Production Corp. He has been with the company almost 25 years.

W. L. KYGAR has been made assistant manager of Continental Oil Company's motor transportation division, a new position. Mr. Kygar was formerly assistant manager of the production and drilling department. He will serve under the direction of Col. T. D. Harris, manager of motor transportation.

M. M. MONTGOMERY has been promoted to assistant operating superintendent in charge of producing operations for Stanolind Oil and Gas Co. He has been executive assistant to Vice President J. E. Rouse. Lewis Finch, Jr., formerly West Texas district superintendent at Midland, will succeed him.

MARVIN A. CRENSHAW, manager of operations and planning for California Texas Oil Co., has been appointed assistant to the vice president directing producing and manufacturing. Mr. Crenshaw started in the oil business at the Port Arthur refinery of The Texas Co. and has since continued in manufacturing and production. He came to the New York office of Caltex in 1938.

E. R. Peterson

E. R. PETERSON has been appointed a vice president of Standard Oil Company of California. For the past several years Mr. Peterson has served as secretary of the company's executive committee and has performed confidential analysis for the executive staff. He joined Standard in 1923 and served in the marketing department until 1936, when he was attached to the executive staff as a general assistant.

THOMAS A. HENDRICKS has joined the foreign exploration department of Stanolind Oil and Gas Co. as consulting geologist. He will be top geological advisor in Stanolind's search for oil in foreign lands.

GEORGE B. JENKINSON, JR., has been appointed assistant manager of foreign exploration for Stanolind Oil & Gas Co. William G. Lackey succeeds him as manager of the land department. Both will continue to be located in Tulsa. Sanolind started foreign exploration work early this year and now has field parties at work in Canada and Colombia.

REESE H. TUCKER of Tulsa, has been re-employed by Cities Service Oil Co. to fill the newly-created post of manager of geophysics for the company at Bartlesville. Mr. Tucker was first employed by Cities Service as a junior engineer in 1930. He resigned in 1944 to form Tucker Exploration Co., of which he is president. The exploration company that bears his name will be liquidated.

HAROLD SYDNOR, formerly coordinator of fuel products operations, has been appointed assistant to the vice president in charge of manufacturing for Esso Standard Oil Co. Thomas W. Moore was named coordinator of refining operations and assistant to the general manager. Also named an assistant to the general manager was Herbert R. Poland who will be in charge of long-range planning and special manufacturing studies. Claude J. Bigelow was appointed coordinator of East Coast refining operations and secretary of the East Coast manufacturing committee, succeeding Mr. Moore.

Mr. Sydnor has been a member of Esso Standard for 28 years. He is a Marine Corps veteran of World War I and served with the PAW in World War II.

WILLIAM HOLBERT has been named to the new post of division drilling superintendent for Stanolind Oil and Gas Co. at Oklahoma City. He will be responsible for Stanolind's drilling program in Oklahoma, Kansas and northern Louisiana and Mississippi. He was formerly district superintendent at Shreveport, Louisiana. C. J. Christensen, formerly assistant division engineer at Fort Worth, Texas, is the new district superintendent at Shreveport.

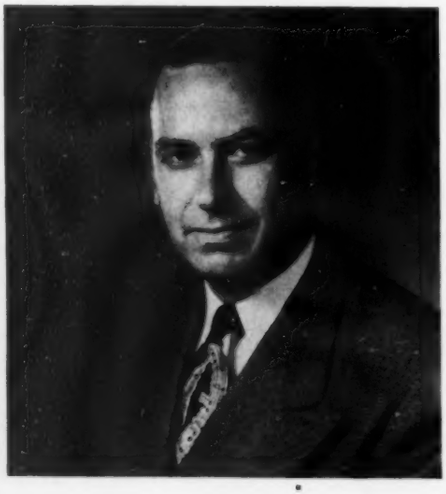
BENJAMIN BREWSTER has been appointed to the newly-created position of manager of the technical service division of the Ethyl Corp. Research Laboratories in Detroit. The technical service division is the liaison group between the Ethyl laboratories and oil company research departments, and automotive and farm equipment manufacturers.

J. H. SNYDER has been appointed director of market research for Continental Oil Co. He was formerly with several internationally known manufacturers and merchandisers in the automotive and aviation fields and has had experience in all phases of marketing, advertising, sales promotion and market research.

S. L. GILLIAM has retired as purchasing agent for Mid-Continent Petroleum Corp., Tulsa. He is succeeded by his assistant, C. W. Wallace, who will assume the title of assistant manager of the materials and purchasing department. Head of the department is W. G. Warnock.
Mr. Wallace joined Mid-Continent as a timekeeper in 1923. He transferred to the purchasing department in 1924 and was made assistant purchasing agent in 1941.

K. E. BEALL has been elected vice president in charge of the economics department of Phillips Petroleum Co. He succeeds J. M. Sands, who reached retirement age this year. Mr. Beall joined Phillips in 1920 as a production engineer. Upon the organization of the economics department, he transferred to that department and since 1946 has served as manager.

Marvin A. Crenshaw



Reese H. Tucker

K. E. Beall

A. W. McKinney

Heads Equipment Suppliers

A. W. McKinney, executive vice president and general sales manager of National Supply Co., Toledo, was elected president of the Petroleum Equipment Suppliers Association at its recent annual meeting at Colorado Springs, Col. He succeeds Ardon B. Judd of Republic Supply Co., Houston.

James Joins Security

R. E. James has been made New York division manager for Security Engineering Co., Inc. He will have charge of export sales of Security drilling and production equipment. Mr. James was with National Supply Co. for four years and with Oil Well Engineering Company for sixteen. In this latter capacity he was assistant and deputy to the general sales manager of the company.

FRED B. BRANSON and Allen H. Lemmon have been elected assistant comptrollers of Gulf Oil Corp. Mr. Branson has been assigned the supervision of production, pipeline and research accounting and auditing activities. Mr. Lemmon will supervise general administrative accounting and will continue as previously in charge of the statistical and printing standards departments.

JOHN S. BOLDRICK, formerly division petroleum engineer at Humble Oil & Refining Company's Louisiana division offices in New Orleans, has been appointed assistant division superintendent. J. C. Posgate, former assistant division petroleum engineer, succeeds him. The new assistant petroleum engineer is H. M. Krause, Jr.

HARRY B. HILL, supervisor of the Dallas, Texas, field office of the U. S. Bureau of Mines for the last 24 years, has retired after three decades of government service. Mr. Hill joined the bureau in 1918 at Muskogee, Okla., and served for a time at Salt Creek, Wyo., and Washington, D. C. He became supervising engineer of the Dallas office in 1924. At the time of his retirement on July 1 he was 64 years old. Charles B. Carpenter, petroleum engineer closely associated with Mr. Hill at the Dallas field office since he joined the bureau 20 years ago, has been promoted to supervising engineer.

JOHN M. PEIRCE, economist for the Western Oil and Gas Association for the past three years, has been appointed executive secretary of the association. He succeeds Don E. Gilman who resigned. Mr. Peirce has had more than 20 years' experience in the field of business economics and taxation, has been serving the western oil industry as technical consultant on economic problems and related subjects.

WARD P. ANDERSON has been appointed general manager of refineries for Caltex in the East of Suez and Eastern Mediterranean territories. Mr. Anderson started in the research and development department of the Richmond refinery of Standard Oil Company of California in 1925. After some years in this department and as foreman of the cracking unit department, in 1936 he went to Bahrein Island in the Persian Gulf as superintendent of the Caltex refinery then being built. He became general manager at Bahrein in 1942 and continued until 1946 when he was transferred to the New York offices of Caltex.

Ward P. Anderson

Angus Valve and Seating Cups are supplied in accordance with A. P. I. Std. No. 11A.

Announcing....

ANGUS CUPS

now available

Angus Cups—the first high-grade Valve and Seating Cups of British manufacture—are now available to Oil Field Engineers. Produced from "Gaco" Fabric composition, an extremely tough and wear-resisting compound, with our famous "Gaco" synthetic rubber as the bonding medium.

Layers of fabric are impregnated with "Gaco" and moulded under heavy pressure to form a tough compact composition capable of resisting the action of abrasion, crude oils and gases at high working pressures and temperatures.

Years of intensive research are behind the development of Angus Cups. Supplied in three hardnesses, sizes as laid down by A.P.I. standards.

★

Our "Gaco" synthetic material, which achieved a wide reputation before and during the late war as a medium for hydraulic sealing in aircraft and engineering mechanisms, is also now available for the manufacture of other products used in the Oil Industry.

ANGUS GACO CUPS

GEORGE ANGUS & Co LTD

Est. 1788
Manufacturers
Oil Seal Works
NEWCASTLE UPON TYNE, 6, ENGLAND
EXPORT DIVISION: Angus House, 7, Bury St., St. Mary Axe, London, E.C.3.
AGENTS THROUGHOUT THE WORLD

Line Pipe Released

Steel pipe originally intended for use in construction of the Trans-Arabian pipeline has been released to the Tennessee Gas Transmission Co., of Houston, Texas. The pipe, 30 and 31 inches in diameter, will go into the Tennessee Gas system, which runs from the Mexican border in Texas to West Virginia.

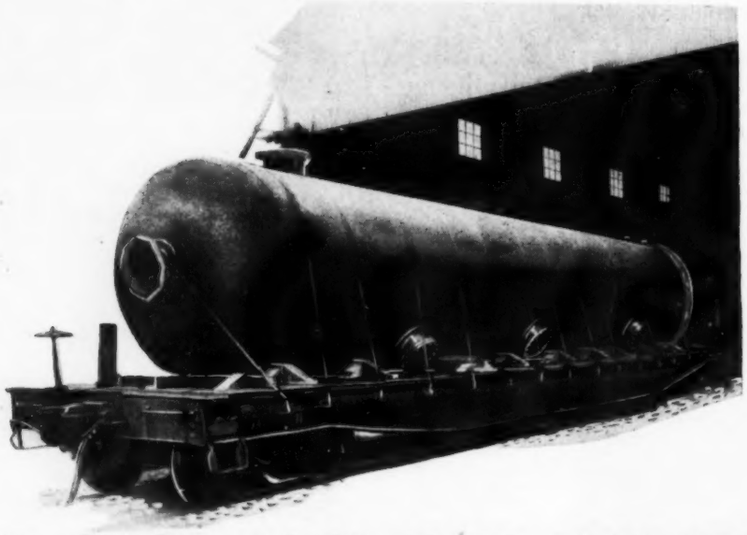
The Trans-Arabian Pipe Line Co. released the pipe because of the Department of Commerce's action in delaying export licenses for shipments to the Middle East. Hull said his company intended to complete the line between the producing fields of Saudi Arabia and the Mediterranean as soon as conditions permitted, but that in the meantime it wished to contribute toward improvement of the domestic fuel supply situation. Tennessee Gas will repay Trans-Arabian with pipe from its deliveries scheduled later in the year.

Worthington Retires

J. T. "Jack" Worthington, general field superintendent for the California division of the Petroleum Rectifying Co. of California, has recently retired. "Jack" has seen over forty years of oil industry activity, mainly in construction and electric dehydration. Since his employment with Petreco, Mr. Worthington has supervised the installation of electric dehydrating plants throughout the oil fields, from Texas to California. During recent years his activities have been concentrated in California, in the Los Angeles basin particularly.

PRESSURE VESSELS

- Towers
- Absorbers
- Scrubbers
- Drums
- Pressure Storage
- Processing Equipment



OUR SHOP FACILITIES INCLUDE:

- 31,000 sq. ft. of CRANE SERVED FLOOR SPACE.
- 80,000 lbs. CRANE AND TRUNNION DESIGN CAPACITY.
- ROLLS CAPABLE OF ROLLING 1½" Steel to 3' Diameter in 10' RINGS.
- STRESS RELIEVING FURNACE . . . Capable of handling Vessels 6' in diameter, by 70' LONG.
- RADIUM CAPSULES FOR RADIOGRAPHING.
- AUTOMATIC SUBMERGED ARC WELDING IF DESIRED.
- FULLY QUALIFIED MANUAL WELDERS AND SUBMERGED ARC PROCESS OPERATORS.
- HEAD STOCK UP TO 10' x 600 lbs. per sq. inch W.P.
- FULL-TIME NATIONAL BOARD INSPECTION.

Send Inquiries to REFINERY EQUIPMENT DEPARTMENT
BUTANE EQUIPMENT CO., INC.
Box 9275
DALLAS, TEXAS Telephone: LD-140

Bruce C. Clardy

BRUCE C. CLARDY of Tulsa, Okla., has been appointed general manager of crude oil supply and manager of the products pipeline department of Standard Oil Co. (Indiana) with his office in Chicago. Mr. Clardy has been president of Stanolind Pipe Line Co. since 1946. In 1943 and 1944 he served as assistant director of supply and transportation for the Petroleum Administration for War. His specialty was direction of crude oil allocations to refineries as well as purchase and sale of crude and products carried by the Big Inch and Little Big Inch pipelines.

Johnstons Form New Companies

M. O. Johnston, oil tool manufacturer, of Los Angeles, has joined forces with Edgar Johnston, of Longview, Texas, in the formation of the Johnston Enterprises, a Johnston family business. M. O. Johnston is president, Blaine Johnston is general manager, and the other owners are M. O. Johnston, Jr., Warren Johnston, E. C. Johnston, Jr., Gordon Johnston and Glenn Johnston.

Johnston Enterprises controls the patents and manufacturing rights of the new Hydro-Line principle. This new development departs from conventional means of hoisting operations by combining hydraulics with the wire line. The Hydra-Line division has headquarters at 3035 Andrita Street, Los Angeles. First product manufactured at the Longview plant is the Mason Hydra-Line rig which eliminates drawworks and traveling blocks on heavy-duty, deep-well drilling rigs as well as on portable and semi-portable drilling and workover rigs.

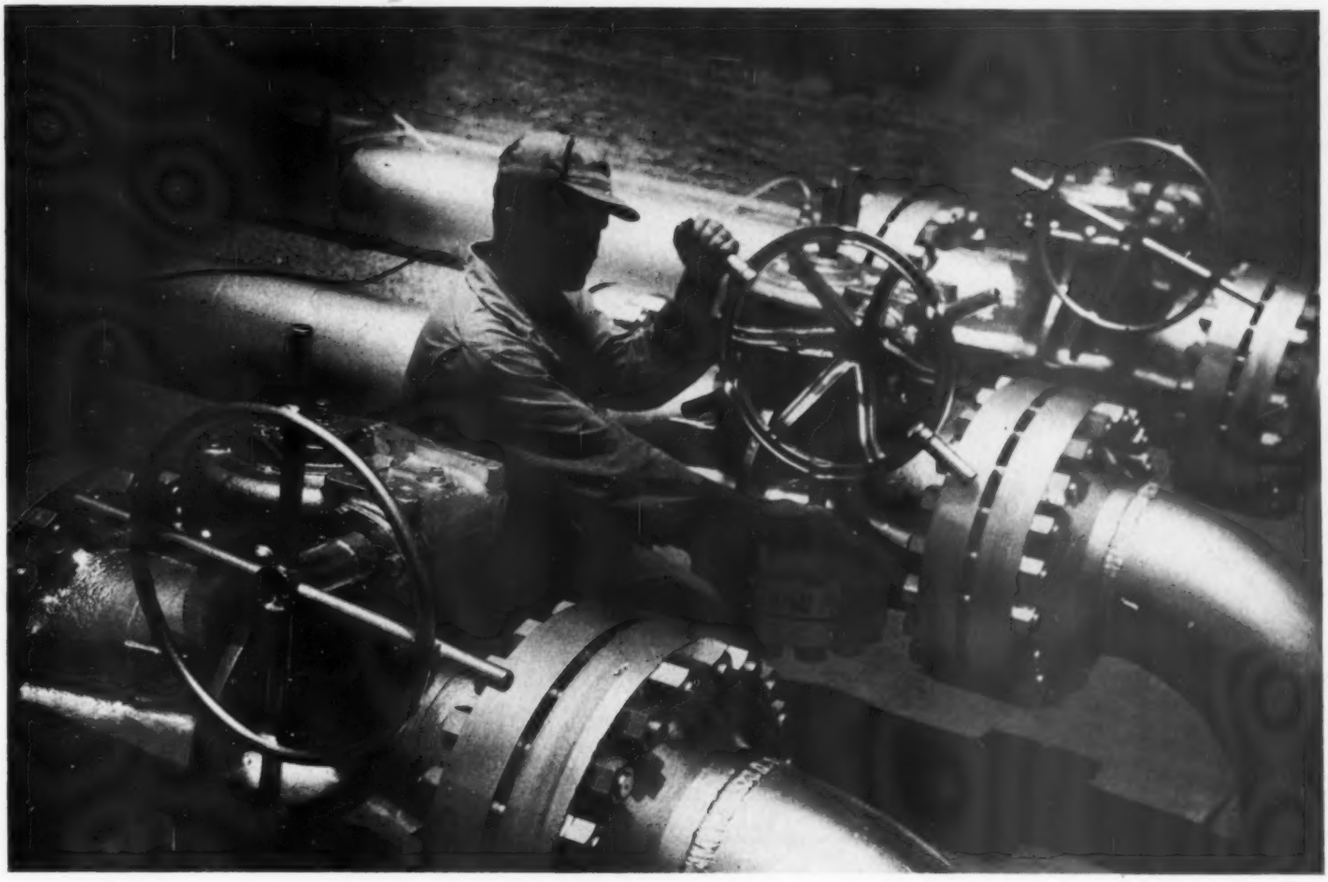
Pantepec Income Higher

Net income of Pantepec Oil Company of Venezuela, C.A., for the year ended December 31, 1947, was the largest in the history of the company, amounting to $3,319,607, equal to $1.11 a share of capital stock, according to the annual report issued by C. U. Daniels, president. This compares with net income of $2,253,856 or 75 cents per share for the year 1946. The company's share of capital expenditures for 1948 drilling and development work in Venezuela is estimated at $6,366,000, Mr. Daniels said.

FPC Approves Texas-New York Line

Federal Power Commission has approved the application of Trans-Continental Gas Pipeline Co. of Longview, Texas, for permission to construct a trunk line for the transportation of natural gas from Texas to the New York area. Authorization is conditioned upon the commencement of construction within a year and completion within 28 months. Claude Williams of Dallas, Texas, is president of the pipeline company.

AUDCO-NORDSTROM *valves*



Petroleum engineers are quick to appreciate the superior characteristics of Audco-Nordstrom lubricated valves. Simplicity marks the design—a tapered plug seated on a film of lubricant. You can jack the plug by turning an external lubricant screw. But lubricant performs another vital function; it seals around each port. The seat is never exposed to the line. There's nothing to clog, no threads to force to get a tight closure. Here indeed is sound mechanical design. Install Audco-Nordstrom valves.

KEEP UPKEEP DOWN

USED THROUGHOUT THE PETROLEUM INDUSTRY—WORLD-WIDE ACCEPTANCE

Audco-Nordstrom

BRITISH AMERICAN

LUBRICATED PLUG VALVES

AUDLEY ENGINEERING COMPANY, LTD., Newport, Shropshire, England

Overseas Agents located in South Africa, Australia, India, Trinidad, British West Africa, Finland, Norway, Sweden, France, Belgium, Switzerland, Italy, Roumania, Spain and Portugal.

NORDSTROM VALVE DIVISION *Rockwell Manufacturing Co.*
400 N. Lexington Ave., Pittsburgh 8, Pa.
Export: Rockwell International Corp., 7701 Empire State Bldg., New York 1, N. Y.
Canadian Licensees: Peacock Bros., Ltd., Montreal, Quebec.

Returns from Latin America

A. R. Weis, president of Pacific Pumps, Inc., Huntington Park, Calif., and member of The Dresser Industries board of directors with which his company is affiliated, recently returned from an extensive survey of the oil-producing areas in Mexico, Central and South America. Traveling by air, Mr. Weis was able to study conditions at first hand in the major oil-producing areas in Mexico, Venezuela, Colombia, Peru, Bolivia and Argentina.

"Mexico welcomes the entry of foreign oil capital, and the country's oil resources can be developed in a comparatively short period to a point where they will be producing for all of their own needs as well as exporting an equal amount," Mr. Weis said. "However, the entire program is dependent upon the procurement of sufficient steel products for their needs.

A similar receptive attitude in the other oil-producing republics plus Brazil's vast possible oil areas presents a very favorable picture. In my opinion our greatest potential export market for some years lies to the south."

H. B. Wallace A. F. Downham W. H. Hardie

Foster Wheeler Staff Changes

Foster Wheeler Corporation has announced three changes in its sales staff. H. B. Wallace, Jr., has been appointed manager of steam sales for the corporation. He had been manager of the New England territory in Boston since his return from the armed service. A. F. Downham has been appointed manager of the New England territory succeeding Mr. Wallace. Mr. Downham was formerly in the sales department of the Pittsburgh office. W. H. Hardie has joined the new York sales office and will concentrate on the sales of steam generators, pulverizers, superheaters and related products.

DR. THEODORE A. LINK has resigned as chief geologist for Imperial Oil Limited, with which company he has been associated for 29 years. Dr. Link will engage in general consulting practice with headquarters in Toronto and will announce his business address in Toronto, Ontario, and Calgary, Alberta, as soon as established. In the meantime he may be reached at his home address, No. 7 Grenadier Heights, Toronto 3, Ont.

Write for this helpful booklet

You are not obligated

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

Republic Ships from New Mill

First shipment of pipe from Republic Steel Corp.'s new large-diameter pipe mill left Republic's sprawling Gadsden plant consigned to the Southern Natural Gas Co., Birmingham, on July 1. The shipment was the first of a total of 140 miles of 24-inch pipeline pipe which Republic will make on the new mill for the gas company. When operating at full capacity, the mill will produce about 65 miles per month. Mr. E. I. Evans, manager of Republic's operations in the south, said that the mill had been designed and built in what he believed to be record time.

The pipe mill is able to produce electrically welded steel pipe in diameters from 20 to 30 inches and in lengths of 30 feet. In some instances, two sections will be welded together before leaving the plant, so that shipment of single sections 60 feet in length will be possible. Construction of the mill has made necessary erection of two buildings and open storage areas. Eventually employment of up to 300 additional persons will result from placing the mill in full operation.

Bethlehem Supply Co. Promotions

G. A. Thompson has been appointed president of Bethlehem Supply Co., Tulsa. He formerly was vice president. C. R. Zimmerman, assistant to the vice president, sales department, Bethlehem Steel Co., has been made executive vice president of Bethlehem Supply. J. F. Eaton, manager of the plant at Tulsa, has been named vice president in charge of manufacturing. I. C. Smith, manager of the Corsicana plant, has been appointed general manager of sales.

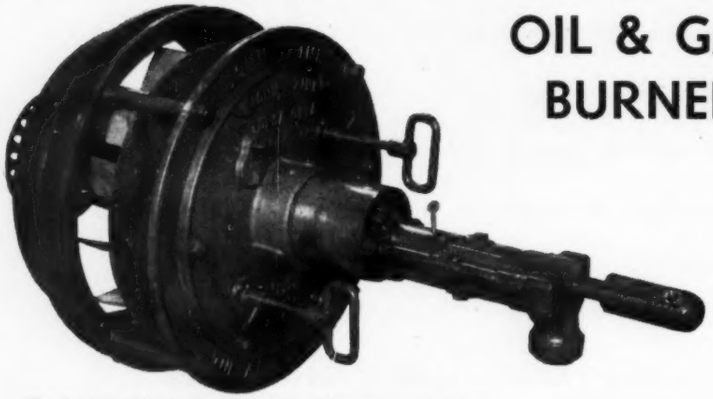
New Conservation Law Drafted

The Interstate Oil Compact Commission's comprehensive oil and gas conservation law is being rewritten, and it is expected that the revised draft will be ready for use of state legislatures convening in 1949. Task of rewriting the law was assigned to a subcommittee of the legal committee which, in a three-day session in Santa Fe, N. M., laid out the framework of the new material. T. Murray Robinson, Oklahoma City attorney, is chairman of the subcommittee.

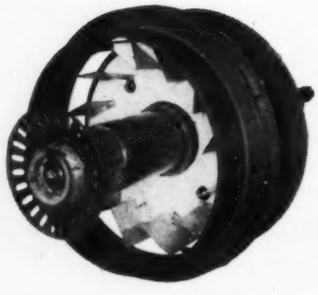
Silicone Booklet

A 30-page illustrated bulletin (No. CDR-57) describing silicone products has been issued by General Electric Co. The bulletin describes the new G-E silicone resins, oils, greases, water repellents and rubber together with their many industrial uses. Copies may be had by writing General Electric Co., chemical department, Pittsfield, Mass.

JOHN ZINK'S NEW "Y" COMBINATION OIL & GAS BURNER



Fuel scarcity is no problem if you use John Zink Series Y Burners because this burner burns either, or both, gas and oil with the same heat pattern.



FEATURES:

Independently removable fuel guns. Uninterrupted Burner Service. Easy to remove fuel guns—feather weight type, one man can remove for inspection and cleaning while the boiler remains in service. Easy to operate. Simple in construction. No tile necessary — may be installed in circles turned in firebrick.

WRITE FOR LITERATURE

JOHN ZINK COMPANY
4401 S. Peoria **Tulsa 1, Oklahoma**

45,000 MOBILGAS DEALERS PROVE A POINT!

A Good Man is Not Hard to Find

Mobilgas

SOCONY-VACUUM

What's a "good man"?... For you, a motorist, he's a man *who knows your car*... expert, experienced, courteous.

He delivers quality products—with quality service. Backed by the company with 82 years' leadership in Petroleum Progress—with Mobilgas—U.S.A.'s favorite gasoline—Mobiloil—the world's quality motor oil—and famous Mobil Tires, Batteries, Accessories...

He's your man with everything your car needs—at the Sign of Friendly Service!

82 YEARS' LEADERSHIP IN A PROGRESSIVE INDUSTRY—PETROLEUM

SOCONY-VACUUM OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

To Build New Tankers

Sun Shipbuilding and Dry Dock Company has just received a contract to build two additional supertankers for the Standard Oil Co. of New Jersey. This order increased the number of tankers for Standard Oil to four. Sun Ship's contracts for the huge type of tanker now total 15. In order to build these supertankers, Sun Shipyard engineers are extending five of the eight shipways.

Of the 15 tankers, seven are for Tankers Navigation Company, Inc.; four for Standard Oil Co. (N. J.); two for Gulf Oil Corp., and two for Sun Oil Co. The new Standard Oil ships will be 600 feet long with a beam of 82 feet 6 inches and depth of 42 feet 6 inches and deadweight tonnage 26,000. Propulsion will be single screw geared turbines. Shaft horsepower 12,500; speed, 16 knots and cargo capacity 230,000 barrels.

Ideco Changes Export Personnel

A. L. Woracek has been appointed export manager of sales of steel buildings, derricks, towers and machinery in the New York export office of International Derrick and Equipment Company. Mr. Woracek has been with Ideco for 23 years and has been associated with all phases of export operations. He has made a number of trips to South American oil fields and is credited with the development of tropical camp buildings now in use by major companies in many tropical operations. He is a member of the New York Chapter of Nomads.

B. V. Brown will act as export manager of sales of machinery and supplies. Mr. Brown is a member of Nomads New York Chapter. James E. McGuire of Ideco's Dallas export office has been transferred to New York to become export purchasing agent and office manager.

To Build Gasoline Plant

Sun Oil Co. will build a gasoline and pressure maintenance plant near Jameson field in Coke County, Texas, beginning about August 1. Capacity will be 10,000,000 cubic feet per day, and production will be 30,000 gallons per day of liquid hydrocarbons. J. F. Pritchard Co., Kansas City, Mo., is the contractor. Construction is expected to be completed by March 1, 1949.

ROY J. DIWOKY has been promoted to assistant general superintendent of the Whiting, Ind., refinery of Standard Oil Company (Indiana). Mr. Diwoky joined the company in 1935 as a member of the technical service staff of the research department at the Whiting laboratory, where he became a group leader in 1939. He was appointed superintendent of the Whiting projects division in 1947.

Nomads have their moments of relaxation when they indulge in games of skill—or even of chance. Above are members of the Tulsa chapter engaged in horseshoe pitching at the home of Regent Henry A. Bourne on June 26. The spectators watching Stanolind's Bob McCloy in his attempt to toss a "ringer" are, left to right: Ed Bolger, W. C. Norris Inc.; Opie Dimmick, Century Geophysical Co.; Bill Butler, W. C. Norris, Inc.; O. F. (Jack) Cozier, World Petroleum; Larry Seaman, Sinclair Oil & Gas Co.; Russell Reum, Franklin Supply Co.; H. M. Cosgrove, executive secretary, National Board of Regents; E. A. Taggart, W. C. Norris, Inc.; Jack Beesley, Baroid; J. S. George, Tughes Tool Co.; Bill Davidson, W. C. Norris, Inc.; Paul Fitzgerald, Dowell, Inc.; Clair A. Nabors, Reed Roller Bit Co.

Instant constant contact

throughout the whole network of depots and mobile units

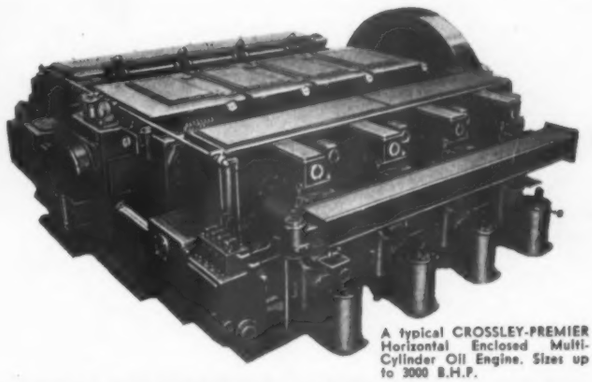
The G.E.C. Radio Telephone equipment provides a means of making instant contact at all times between main-depot, sub-depots, tankers and vehicles under conditions of privacy. There are no wires that can be cut or tapped, which makes this the ideal communication system for use in countries where long telephone wire links would otherwise be necessary. The equipment is as simple to use as the telephone, no special training being necessary. Vehicle installations include facilities for use on public address work—a great advantage in controlling labour.

Further information will gladly be given upon request.

by G.E.C. V.H.F. RADIO TELEPHONE EQUIPMENT

The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

No higher praise than REPETITION



A typical CROSSLEY-PREMIER Horizontal Enclosed Multi-Cylinder Oil Engine. Sizes up to 3000 B.H.P.

REPEAT ORDERS FOR 28,500 H. P. NOW IN HAND

Once a mine, quarry, oilfield, water undertaking, generating station or industrial user has experienced the outstanding qualities of its first CROSSLEY PREMIER ENGINE — then another and another CROSSLEY PREMIER is the choice when addition power is required.

More than 130,000 H.P. in *repeat orders alone* have been received to date. What more sincere tribute could there be to the rugged reliability of CROSSLEY PREMIER Engines under the most arduous duties and difficult conditions?

CROSSLEY - PREMIER ENGINES LTD.
SANDIACRE NR. NOTTINGHAM, ENGLAND

London Office: Langham House, 308, Regent Street, W.1.

Our range of **SPECIALISED PRODUCTIONS** for the **OIL INDUSTRY** includes **CAST & FORGED STEEL, CAST IRON & GUNMETAL,** etc., **GATE, STOP & CHECK VALVES** for Low, Medium and High Pressures and temperatures, and for Water, Steam, Oil, Air & Gas, etc., Services.

We manufacture (under licence) the famous **NEWMAN-MILLIKEN GLANDLESS LUBRICATED PLUG VALVES** for Christmas Trees, Mud Lines and all Oilfield Services. These Valves can be supplied in metals to suit particular services, and for working pressures to 5,000 lbs. per square inch (tested to 10,000 lbs. per square inch kerosene).

VALVES

meet all Oil Industry requirements

Newman, Hender & Co. Ltd
WOODCHESTER GLOS. ENGLAND

L. C. DAVIDSON of Chicago, has been appointed traffic manager for Cities Service Oil Co. to succeed the late A. C. Holmes. S. P. Kelly, of Bartlesville, Okla., will be assistant traffic manager. Mr. Davidson is a 25-year man with Cities Service and since 1940 has been traffic manager of the marketing division. Mr. Kelly joined the company in 1945. He was in government traffic service during the war.

Announces Expansion Program

Core Laboratories, Inc., Dallas, has announced plans to build over $250,000 worth of portable field laboratory equipment to be used in core analysis and drill cuttings analysis work, and subsequent petroleum reservoir engineering studies. Some of the new equipment has been designed especially for use on offshore locations. This will be accomplished by setting a completely unitized laboratory on the drilling company's operating barge. New stationary labs have been established at Abilene and Midland, Texas, for making complete analysis of fractured lime. Other Core Lab installations which have moved into new and enlarged quarters include Lafayette, Louisiana; Corpus Christi and Tyler, Texas; and Oklahoma City.

Tank and Line Heater Bulletin

The Brown Fintube Co., Elyria, Ohio, has published Bulletin No. 482 dealing with tank suction heaters and line heaters. The bulletin gives dimensions and detailed tables to show capacity of various units under typical operating conditions.

Motor Bulletin

Information on Allis-Chalmers general-purpose motors in contained in a new "Handy Guide for Quick Selection of Electric Motors" released by the company. The new 12-page bulletin provides detailed specifications covering squirrel-cage induction motors and application data, range of sizes and speed torque curves on synchronous, wound rotor and direct current motors. It covers applications and features of gearmotors and multispeed induction motors and carries an induction motor selection chart for units from one to 200 horsepower. Address Allis-Chalmers at Milwaukee, Wis., for copies.

W. E. Largey

Largey Duties Increased

W. E. Largey has been appointed advertising manager of the oil tool division of Byron Jackson Co. He will continue as advertising manager of the Patterson-Ballagh division. C. W. Smick of the pump division will continue as advertising manager of that division.

Seismic Equipment Catalog

Century Geophysical Corp., Tulsa, has published a new catalog describing seismic equipment manufactured by the company under issued and pending patents. Described are water trucks, shooting trucks, recording trucks, drill trucks, surveyors trucks, oscillographs, galvanometers, amplifiers, seismometers and special cables. Century Geophysical was organized in 1946 as a consolidation of Century Manufacturing and Instrument Co. and Continental Geophysical Service.

PANTEPEC OIL CO., C.A., has completed its Roble 17 in the 37,000-acre El Roble concession in eastern Venezuela, with production at the rate of 1,400 barrels per day. The well is a stepout 1,300 yards to the west of Roble 11, the heretofore westernmost well of the field. Roble 11, which was completed last year with an initial production of about 1,300 barrels per day, in turn is a stepout 1,300 yards west of Roble 1. Wells Nos. 17 and 11 extend the field 1½ miles to the west of the boundary attained at the time drilling was suspended during the war.

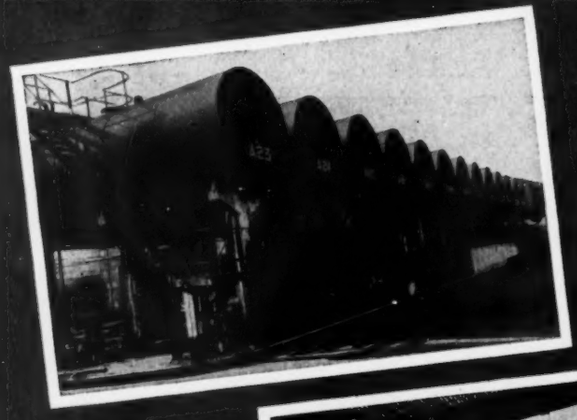
Ideco Promotions

Wm. O. Cook has been appointed assistant general manager for International Derrick and Equipment Company in the Texas division. He has been chief engineer since 1938. A. R. McLerran succeeds Mr. Cook as chief engineer of the Texas division.

Gulf Marine Well In Production

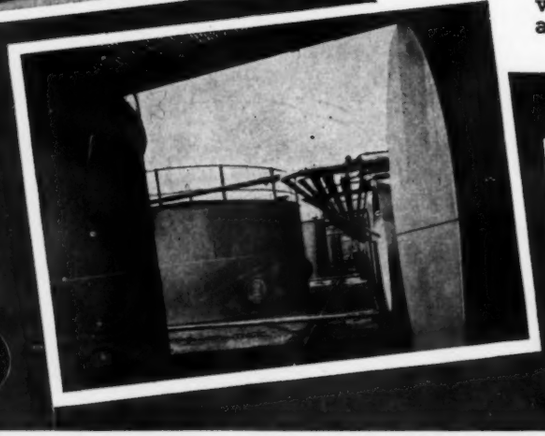
Regular production from the first commercial well completed in the open waters of the Gulf of Mexico was begun on May 4. The well had been shut in for several months after it was brought in, awaiting Coast Guard approval of a tank barge for transporting the oil to shore. The well, which was drilled by Kerr McGee Oil Industries, is located 10½ miles offshore at Point au Fer, Terrebonne Parish, Louisiana. It is reported flowing at about 600 barrels daily.

THE ADDRESS of the Chicago offiecs of WORLD PETROLEUM has been changed from 307 North Michigan Avenue to 612 North Michigan Avenue, Chicago 11, effective July 15, with Mr. G. H. Gannett in charge. New telephone is Superior 7-1273.



OXLEY WELDED STORAGE TANKS

These photographs, taken by permission of Lobitos Oilfields, Limited, show various types of Oxley built installations at Ellesmere Port, Cheshire.



OXLEY ENGINEERING CO. LTD.

OXLEY ENGINEERING CO., LTD., HUNSLET, LEEDS 10

London Office: WINCHESTER HOUSE, OLD BROAD STREET, LONDON, E.C.2.

Telephone: LONDON WALL 3731. *'Grams: "ASBENGPRO STOCK, LONDON."*

BCO Plans Deep Drilling

At the annual meeting of British Controlled Oilfields, Ltd., the chairman, Richard Tweed, told shareholders that the company had placed an order for a heavy-duty diesel-driven rig capable of drilling to 12,000 feet. The outfit is promised for delivery in 1949 and is purchased in preparation for deep tests on the company's holdings in Venezuela, which in the past have produced 30 million barrels from relatively shallow wells.

Decision to seek oil at greater depths has been induced by results obtained from drilling to the Cretaceous in western Venezuela where geological conditions are similar to those on BCO properties. The decision was influenced to some extent also by the announcement of the Venezuelan government that no further concessions will be granted for the immediate future, which appears to prevent a real expansion.

Chairman Tweed also announced that oil production of BCO's subsidiary, Ecuador Oilfields, Ltd., from the El Tigre field had increased during the past year but that its first deep test had not yet been completed. The company holds oil rights on an area of over 52,000 acres in Ecuador.

Joins Export Staff

Jack Faris, for the past 11 years identified with the sales department of The Continental Supply Company, has recently been transferred to the company's export division in New York. Mr. Faris joined Continental in April, 1937, in the Corpus Christi, Texas, store and has since served in several Texas areas.

The perfect
rust inhibitor is
R.L.G. primer—Red Lead and Graphite
finely ground in an oil varnish medium.

INTERNATIONAL PAINTS, LTD.
Grosvenor Gardens House, London, S.W.I.

Loading quarter house on barges for transport to offshore site.

Houses For Marine Drillers

Increasing activity in marine drilling has led to a new development, the building of houses offshore for crews engaged in such work. Several all welded steel houses are being constructed by Avondale Marine Ways of New Orleans for use by the Ohio Oil Company and Magnolia Petroleum Company in the Gulf of Mexico off the Louisiana coast. The houses are prefabricated at the Avondale plant and transported on barges to the drilling sites where they are mounted on piling previously placed on location. All that is necessary to make them livable, after being placed on the piling, is to connect the water and electrical service.

Each house provides living accommodations for approximately 30 persons, including sleeping quarters, toilet and washroom facilities, recreation room, office, galley and an independent mess room, and is fully air-conditioned.

New High Made in Venezuelan Production

Production of crude oil in Venezuela during the month of May amounted to 41,024,856 barrels, an average of 1,323,382 barrels daily. As compared with April this daily average is higher by 20,614 barrels. The daily production on May 31 reached an all-time high of 1,333,047 barrels, and the monthly production for May was also a new all-time high. Exports for the month were 37,584,077 barrels. Production by companies is shown in the following table:

Company			Total
Creole	15,064,003	4,904,133	19,968,136
Mene Grande	1,851,227	4,851,831	6,703,058
Shell	12,322,153	—	12,322,153
Consolidada	—	583,777	583,777
Socony	—	924,856	924,856
Texas	—	213,335	213,335
S.A.P. Las Mercedes	—	182,929	182,929
B.C.O.	32,229	—	32,229
Orinoco	9,266	—	9,266
Phillips	—	49,645	49,645
Rexco	26,832	—	26,832
Atlantic	—	8,640	8,640
Total Barrels	29,305,710	11,719,146	41,024,856
	29,305,710	11,719,146	41,024,856

New Fluid Cat Record

The fluid catalytic cracking plant of Tide Water Associated Oil Co., at Avon, Calif., recently completed a record-breaking run of 610½ days in continuous operation. This new record is 48 days more than the previous longest run of 562 days established at a Louisiana refinery. Since the run was started, about 11,000,000 barrels of 23 gravity heavy wax distillate was charged to the unit at an average daily charge rate of approximately 18,000 barrels. This is the third turnaround of the Avon fluid unit, which was designed by Universal Oil Products Co., erected in 1944 by C. F. Braun and Co., and initially placed on stream Dec. 29, 1944. First run was 145 days, the next 415.8 days.

Petrol Engined Perfection

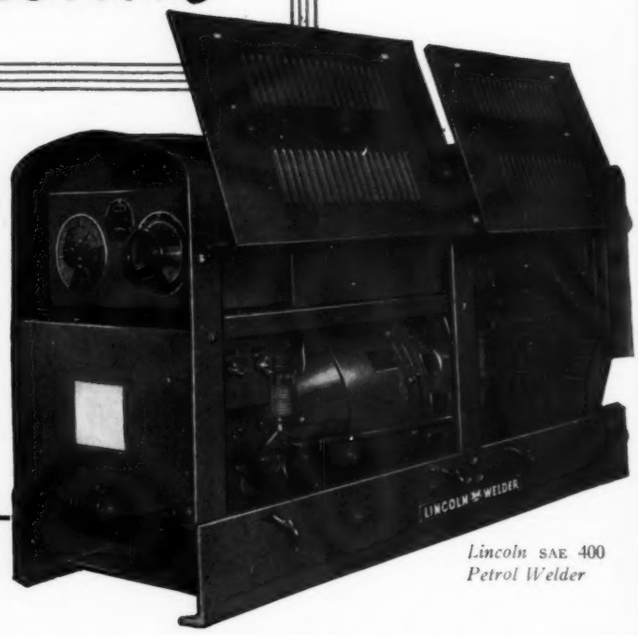
★ LINCOLN GENERATOR WITH DUAL CONTINUOUS CONTROL

★ HEAVY INDUSTRIAL ENGINE DESIGNED FOR DEPENDABILITY

★ BRITISH MADE THROUGHOUT

1948 MACHINE TOOL AND ENGINEERING EXHIBITION LONDON

STAND NO. 52



Lincoln SAE 400
Petrol Welder

LINCOLN

WORLD'S LARGEST MANUFACTURERS OF ARC WELDING EQUIPMENT AND ELECTRODES

LINCOLN ELECTRIC COMPANY LTD · Welwyn Garden City, Herts, England · Welwyn Garden 920

ADVERTISERS INDEX

Allis Chalmers Mfg. Co. 12-13
Airwork, Ltd 1
Aluminum Import Co. 11
George Angus & Co., Ltd. 59
Audley Engineering Co., Ltd. 61
Automatic Telephone & Electric Co. 3

Baroid Sales Div. 23
S. R. Bowen Co. 8
David Brown & Sons 15
Brown & Root, Inc. ..... Inside Front Cover
Butane Equipment Co., Inc. 60
W. P. Butterfield, Ltd. 28

California Texas Oil Co. 6
Chemical Construction Co. 53
Chicago Bridge & Iron Co. 74
Clayton Son & Co., Ltd. 62
Crane Co. 57

E. I. duPont de Nemours & Co., Inc. 67-70

Foster-Wheeler Corp. 17-18

General American Transportation Corp., Wiggins Vapor Seals Div. .. 9
General Electric Co., Ltd. 64

Halliburton Oil Well Cementing Co. 32
Harshaw Chemical Co. 62
G. A. Harvey Co., Ltd. 7
Hughes Tool Co. ..... Inside Back Cover

International Harvester Co. 16
International Paints, Ltd 71

M. O. Johnston Company 27

M. W. Kellogg & Co. 5
Wm. Kenyon & Sons, Ltd. 24
Richard Klinger, Ltd. 55

Lincoln Electric Co., Ltd. 72

Mayes-Bevan Co. 2
Lee C. Moore Corp. 14

A. P. Newall & Co., Ltd. 51
Newman Hender & Co., Ltd. 65
Nordstrom Valve Div. 61

Oxley Engineering Co., Ltd. 66

Patterson Ballagh Div. 19

Republic Steel Corp. 29

Schlumberger Surenco 4
Shell Oil Co. 22
Socony Vacuum Oil Co. 63
Standard Oil Co. (N. J.) 58
Standard Vacuum Oil Co. 26
Stone & Webster Engineering Corp. 25

Tide Water Associated Oil Co. 73
United Steel Companies, Ltd. 20
Universal Oil Products Co. 10
Universal Petroleum Co. 30

Wyatt Metal & Boiler Works ..... Back Cover

Youngstown Sheet & Tube Co. 21

John Zink Co. 62